

# DDC 1.2

## Digital Intelligent Servo Drive with Protection

### Category IP 65

Project Planning Manual

DOK-DIAX02-DDC01\*\*\*\*\*-PRJ1-EN-P



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**Purpose of the documentation** It supplies information on:

- the electrical construction
- mounting the drive controller (basic unit)
- installing the electrical leads to the drive controller

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# 1. Introducing the System

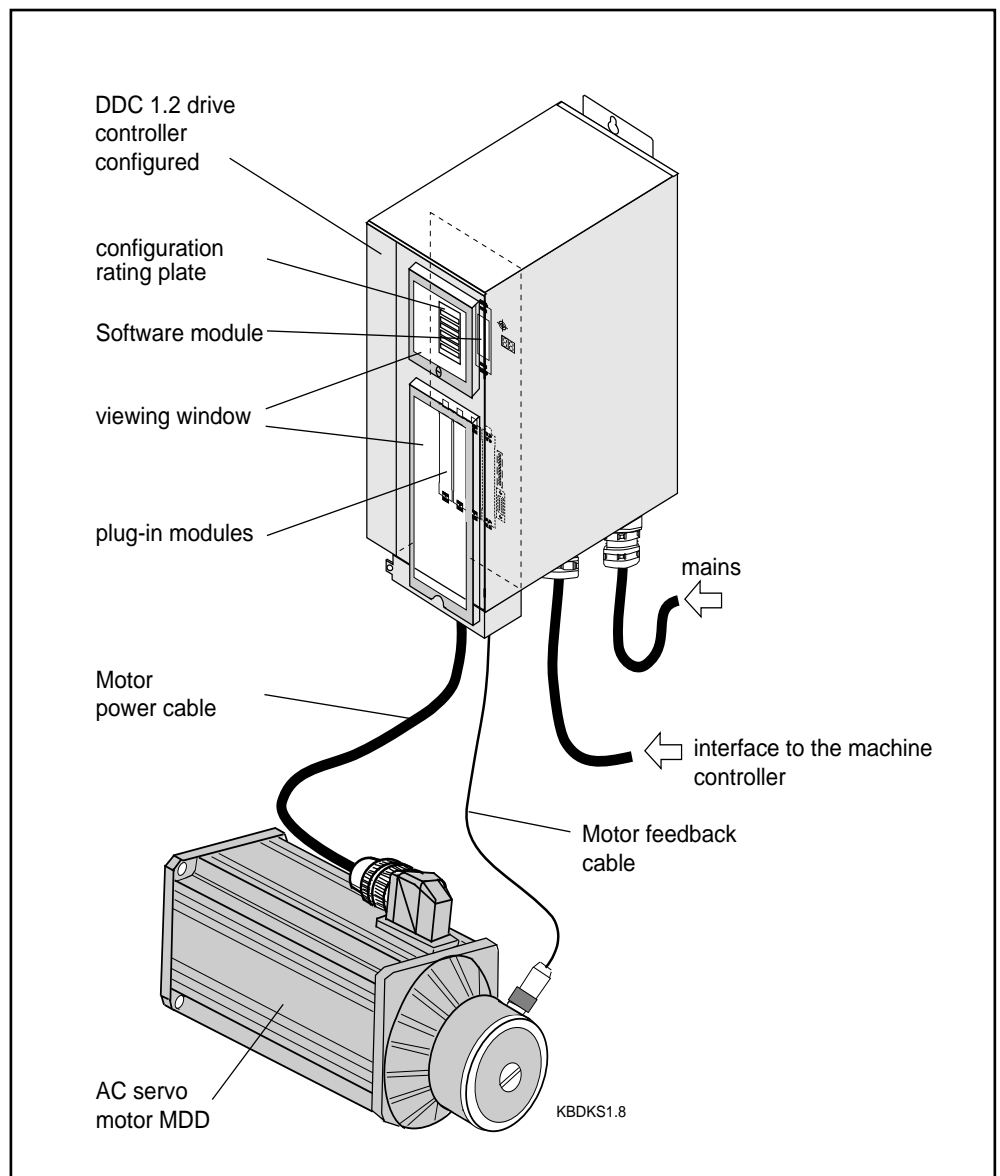


Fig. 1.1: Digital AC drive with DDC drive controller

## Digital AC Drive

Digital AC drives are microprocessor controlled, brushless, three-phase drives which are highly dynamic and have precision servo-control features.

All

- drive control,
- monitoring,
- parametrization and
- diagnostics operations

are performed digitally with a signal processor.

The drive features needed for precise servo-applications are available to the drive because of the high-resolution rotor position measurements across the entire speed range.

## 1.1. DDC 1.2 Servo Drive

IP65 is the protection category of a DDC 1.2. It can be installed directly at the feeder even under less favorable environmental and manufacturing conditions. This avoids long cables susceptible to faults.

*Basic unit* A DC bus converter is built into the basic unit as well as the bleeder resistor for the energy generated during braking, a mains contactor for disconnecting the power and a power section for the control voltages. Plug-in cards are inserted into slots U1 through U5, depending on the application requirements.

### *Drive controller configuration*

A configured DDC is supplied by INDRAMAT as a completely assembled unit.

Such a servo drive is made up of the following components:

- the basic unit
- the command interface card (see section 1.3)
- the software module (see section 1.4)
- optional auxiliary plug-in modules (see section 1.5)
- the configuration rating plate (see section 1.6)

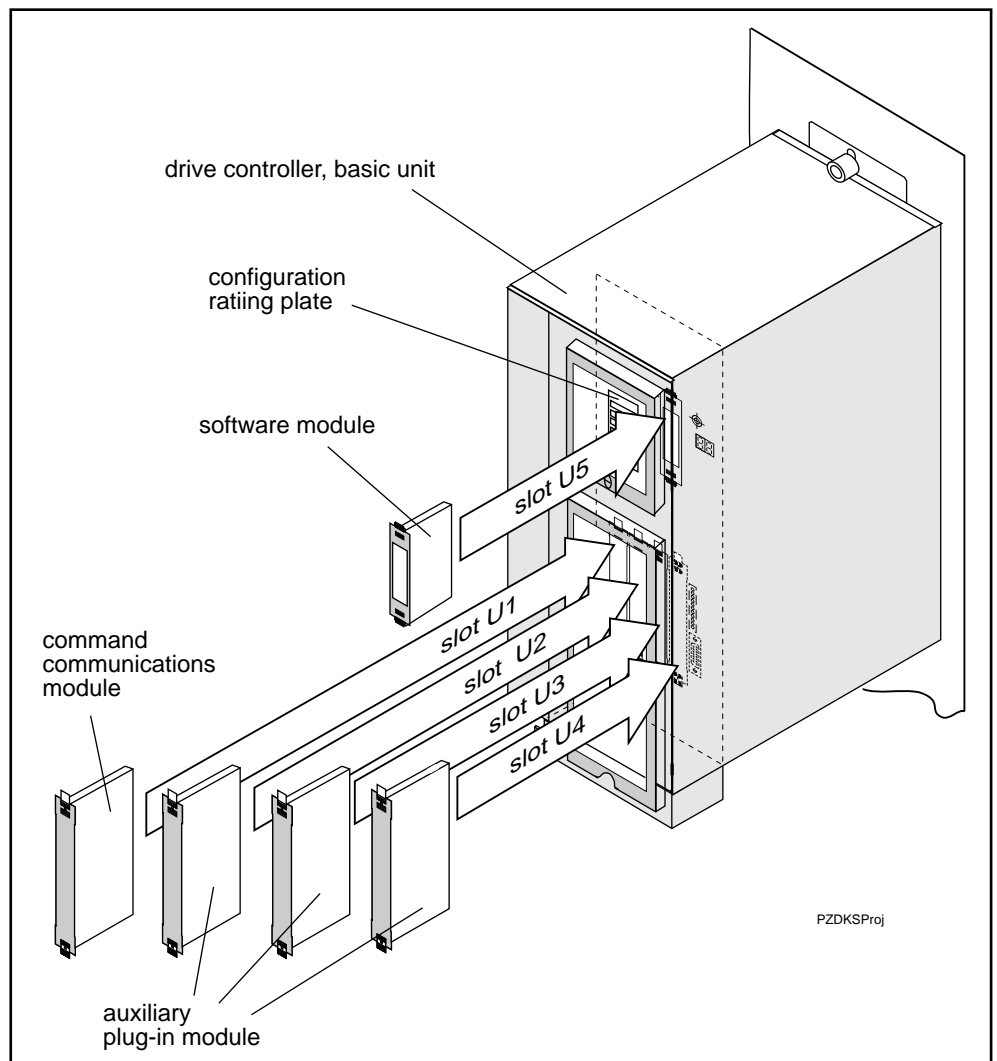


Fig. 1.2: DDC 1 drive controller configuration

## 1.2. Functional Performance Features

### **Protection Category IP 65:**

- space-saving installation, without a control cabinet, directly at the feeder
- elimination of long connections between motor and drive which are susceptible to interference

### **Power shutoff via integrated protection system in DDC:**

- power supply isolated by a contactor built into the unit
- direct connection to 220V three-phase power source
- a longer lifespan due to currentless switching

### **Integral DC bus dynamic braking:**

- If trouble is encountered in the electronic circuitry of the drive, the drive can be decelerated and stopped with an integral dynamic brake system.

### **Inrush current limit:**

- The inrush current does not need to be considered when selecting fuses or circuit breakers for the input power.

### **Flexibility for specific applications:**

- The functions implemented on the drive can be matched to the given application by installing various plug-in modules in the servo drive.

### **Motor holding brake:**

- Control and monitoring of the holding brake of the motor is integrated inside the servo drive unit.

### **Programmable error reactions:**

- In the event of power, drive, or system faults, the drive performs the programmed error reaction.

### **Easy to service:**

- Signal cables are connected via screw terminals.
- Extensive diagnostics via alphanumeric display.

### 1.3. Command Interface Card

Depending upon type, the command interface module is either the interface to the NC control unit or a positioning control unit with interfaces to the hand terminal or the NC control unit of the machine.

The following command interface cards are available:

- SERCOS interface, type: DSS 1.1, DSS 1.3
- ANALOG interface with incremental encoder emulator, type: DAE 1.1
- ANALOG interface with absolute encoder emulator, type: DAA 1.1
- Positioning module, type: DLC 1.1

*SERCOS interface*      Type: DSS 1.1, DSS 1.3

The "SERCOS interface DSS" card allows the digital drives to be operated with SERCOS interface-compatible controllers via optical fiber cables. The interface also has inputs for evaluating reference switches, position limit switches and sensors.

*ANALOG interface  
with incremental  
encoder emulator*      Type: DAE 1.1

The "ANALOG interface with incremental encoder emulator" card permits the intelligent digital AC servo drive to be operated with conventional controllers via an analog interface. It also contains control inputs and signal outputs for communication with attached controllers, and it outputs incremental encoder signals to be used as an actual position value.

*ANALOG interface  
with absolute encoder  
emulator*      Type: DAA 1.1

The "ANALOG interface with absolute encoder emulator" card permits the intelligent digital AC servo drive to be operated with conventional controllers via an analog interface. It also contains control inputs and signal outputs for communications with an attached controller and it outputs actual absolute position values in accordance with SSI standards (**S**ynchronous **S**erial **I**nterface).

*Single-axis positioning  
module*      Type: DLC 1.1

The "single-axis positioning module" card upgrades the servo drive to perform stand-alone, single-axis position control. This card can be programmed with up to 3,000 program blocks. Each program block defines a sequence of movements, a specific condition of the inputs to be monitored, or the outputs to be set.



## 1.4 Software Module

Type: DSM 2.1

Parameters stored in the software module are used to tune the drive to the motor and the mechanics.

*Advantage when replacing unit*

The software module contains both the operating software and the parameters. This module ensures that when hardware is replaced, the previously entered parameters are not lost and can be carried over to the new hardware by simply plugging in the old software module.

*Duplication*

Software modules can be duplicated for use in other, identical machines or for storage purposes.

*Standard software module*

The drive parameter values set by Indramat are stored in the feedback of the MDD motors. These can be activated upon request at the time of commissioning.

The user-specific parameters are set at the machine to the machine-dependent values.



**Documentation and administration of all user parameter values is the sole responsibility of the user.**

## 1.5 Auxiliary Plug-In Cards

The heading "auxiliary plug-in cards" includes the following:

Type: DEA 4.1, DEA 5.1, DEA 6.1

*Input/output interface*

These plug-in cards each have 15 inputs and 16 outputs. The drive uses these to exchange binary signals with a programmable controller.

The three types differ with regard to the internal address set on the card.

*Incremental position interface*

Type: DEF 1.1, DEF 2.1

The auxiliary plug-in cards "incremental position interface" are used to receive squarewave signals so that data from an external measuring system located directly on the moving machine element can be input to the servo drive. The cards differ according to which internal address is set on the card.

*High-resolution positioning interface*

Type: DLF 1.1

The auxiliary plug-in card "high-resolution position interface" is used to transfer sine wave signals so that data from an external measuring system directly mounted to the moving machine elements can be input to the servo drive.



**The technical data and terminal diagrams for the plug-in cards can be found in document "Plug-in modules for digital intelligent servo drives". doc. no.: 209-00069-4356.**

## 1.6 Configuration Rating Plate

The configuration rating plate contains the type codes for:

- the configured servo drive
- the basic unit
- the software module in slot U5
- the plug-in cards in slots U1 through U4

These type codes can be used to determine which components must be located in which slots.

In the event of malfunctions, the information on the configuration rating plate can be used to obtain a corresponding unit or to configure a basic unit. A replacement unit results when a basic unit is configured with the cards identified on the configuration rating plate.



**The configuration rating plate indicates which cards are installed on the servo drive. Before commissioning the servo drive, check to be certain that the actual configuration matches that on the configuration rating plate.**

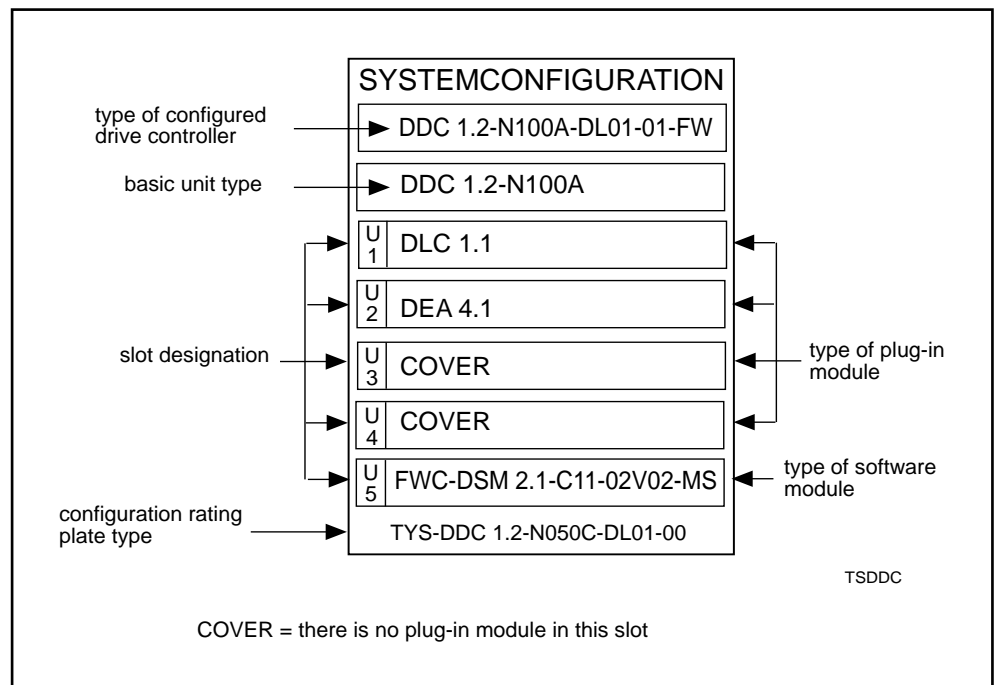


Fig. 1.3: An example of a configuration rating plate

## 2. Technical Data / Ambient Conditions

### 2.1. Data Sheet

| Designation  |            |       | DDC 1.2-N050C  | DDC 1.2-N100A | DDC 1.2-N200A |
|--|------------|-------|--|---------------|---------------|
| Power section  |            |       |  |               |               |
| Input voltage  | U(N)       | (V)   | 3x 220 V (+15%/-10%) or<br>3x 230 V (+10%/-15%)                |               |               |
| Frequency  | f(N)       | (Hz)  | 50 ... 60 Hz   |               |               |
| Peak current   | I(peak)    | (A)   | 50   | 100           | 200           |
| Short-term curent for<br>50 % at100 s duty cycle time                                | I(S6-100s) | (A)   | 50   | 70            | 90            |
| Continuous current (average)   | I(cont)    | (A)   | 25   | 35            | 45            |
| Pulse frequency (PWM-frequency)  | f(T)       | (kHz) | 8  | 4             |               |
| Required connected load  | S(An)      | (kVA) | Depends on motor/servo drive combination - see selection lists |               |               |
| Power requirement<br>with maximum drive load   | S(An)      | (kVA) | 6  | 18            | 22.5          |
| Short term mechanical operating<br>load for 50 % at100 s<br>duty cycle time, approx. | P(S6-100s) | (kW)  | 8  | 12            | 15            |
| Continuous mechanical load,<br>average   | P(mech)    | (kW)  | 4  | 6             | 7.5           |
| Usable mechanical peak load,<br>approx.  | P(mSp)     | (kW)  | 8.5  | 17            | 33            |
| Power loss at maximum device<br>load without bleeder power loss                      | P(V)       | (W)   | 500  |               |               |
| Continuous bleeder power   | P(BD)      | (kW)  | 0,25   | 0.25          | 0.25          |
| Peak bleeder power   | P(BM)      | (kW)  | 10   | 20            | 40            |
| Maximum regenerated power  | W(max)     | (kW)  | 5  | 10            | 20            |
| Weight of basic unit   | m          | (kg)  | 21   | 22            | 22            |
| Environmental conditions   |            |       |  |               |               |
| Permissible ambient temperature<br>for rated specifications                          | T(amb)     | °C    | + 5 ... + 45 °C  |               |               |
| Maximum ambient temperature<br>for derated specifications                            | T(m.amb)   | °C    | + 55 °C  |               |               |
| Storage and shipping temp.   | T(L)       | °C    | - 30 ... + 85 °C   |               |               |
| Maximum installation elevation<br>without derating                                   |            |       | 1000 meters above sea level                                    |               |               |
| Permissible relative humidity  |            |       | max. 95 %  |               |               |
| Permissible absolute humidity  |            |       | 25 g water / m³ air  |               |               |
| Degree of contamination  |            |       | - non-conductive dirt contamination<br>- no condensate         |               |               |
| Protection category  |            |       | IP 65 as per EN 60 529 ( IEC 529 )                             |               |               |

Fig. 2.1: Technical data - DDC 1.2

## 2.2. Operating Conditions

### Increased ambient temperatures

The torque and power ratings listed in the selection documentation apply to an ambient temperature range of +5° to +45° C. Maximum permissible ambient temperature can equal up to +55° C. Otherwise, there is a drop in power as depicted in the following figure.

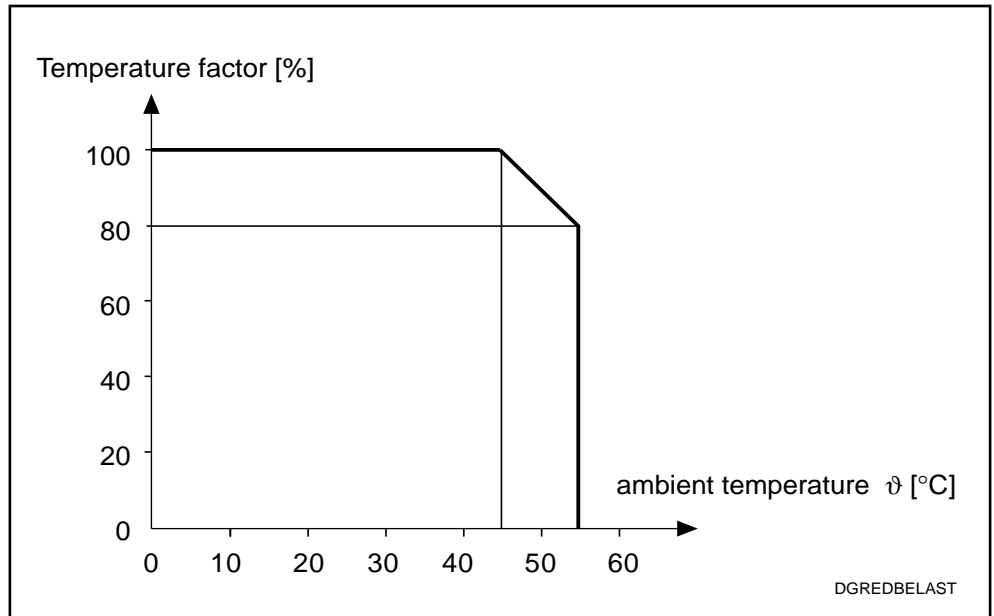


Fig. 2.2: Reductoin in power data with increased ambient temperature

### Installation above 1000 meters

If the unit is installed at elevations higher than 1000 meters above sea level, then torque and power ratings will drop. The following figure depicts this drop.

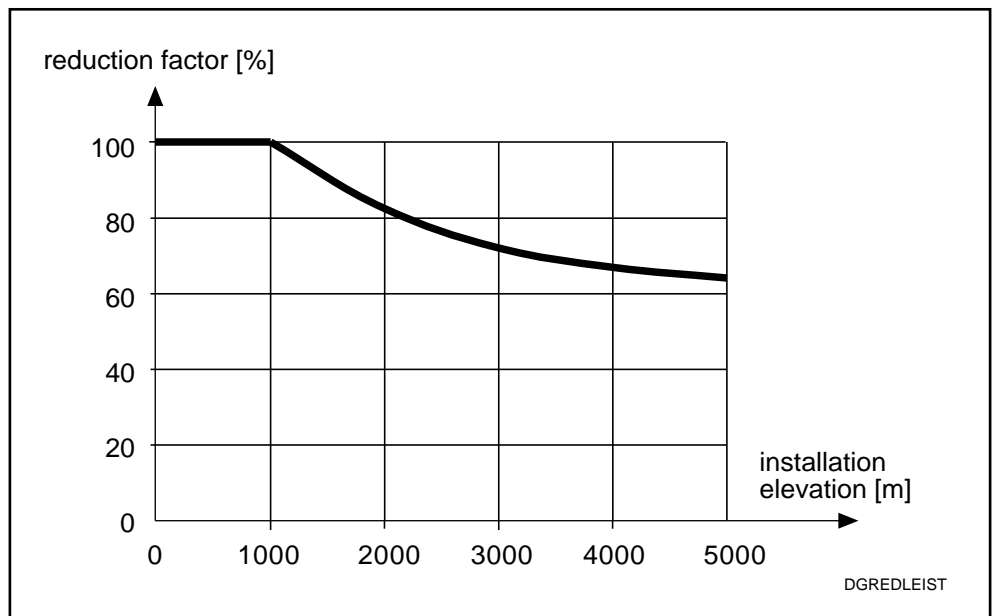


Fig. 2.3: Reduction in power data at elevations greater than 1000 meters.

### 3. Electrical Connections - Installation Guidelines



The DDC 1.2 terminal diagram found in this document is a recommendation of the manufacturer of the unit. The circuit diagrams of the machine builder must be used for installation.

### 3.1. Terminal diagram

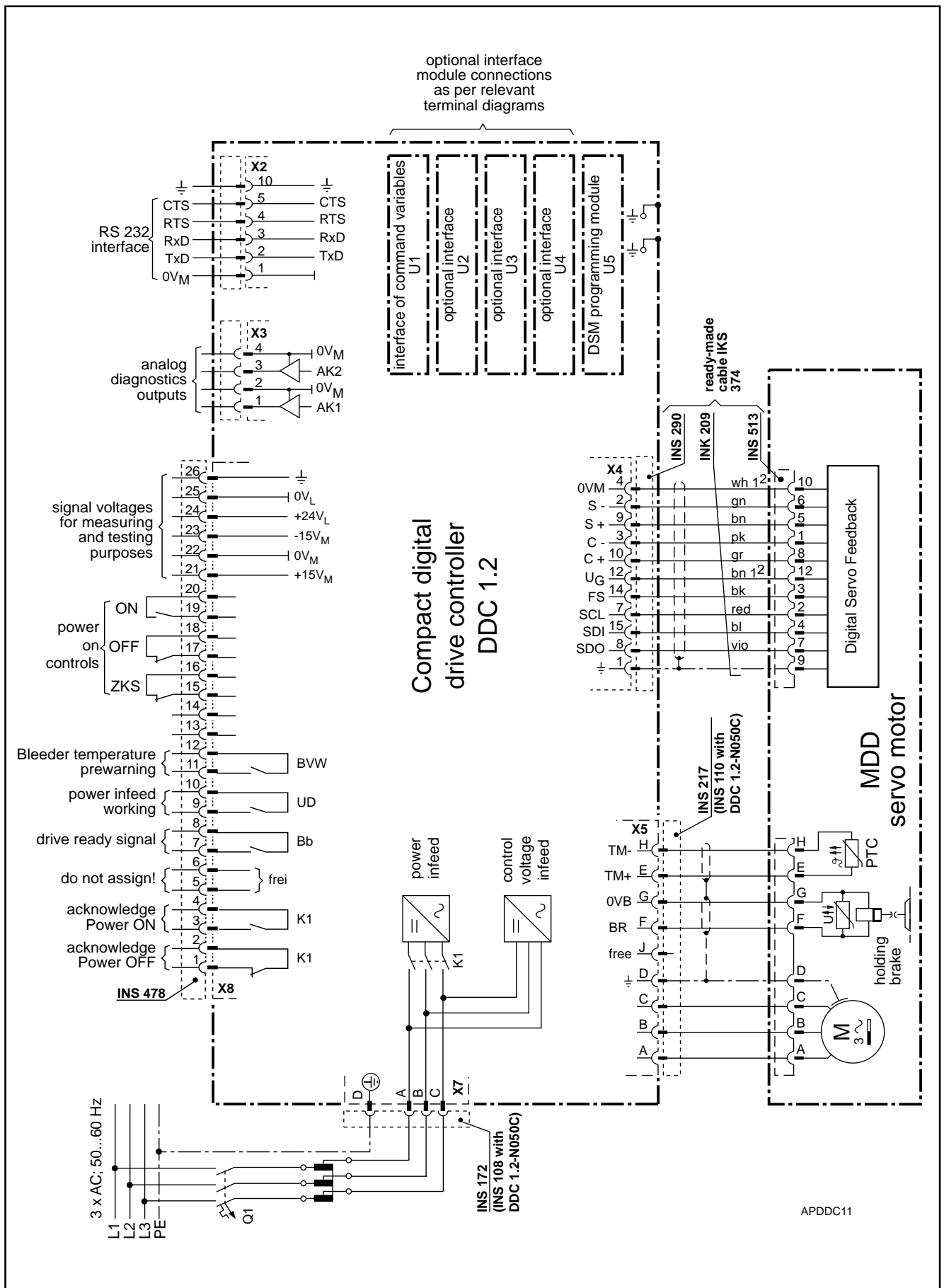


Fig. 3.1: Terminal diagram of DDC 1.2 servo drive

### 3.2. Power Connections

**Connection voltage** The DDC 1.2 drives can be connected to three-phase mains rated at AC 220V (+ 15 % -10%) or AC 230V (+10 / -15%).

**Frequency** 50 ... 60 Hz



**To operate the DDC 1.2 in residential and light industrial areas, it may be necessary to install an rf suppression filter in the mains supply line so that the limits for the emission of interference (radio interference suppression) are not exceeded.**

**Connected load** The connected load must be calculated when determining supply line diameters, fuses and matching transformers.

$$S_{AN} = \frac{M_{eff} \cdot n_{AV}}{9550} \cdot F + 0,125kVA$$

$S_{AN}$  = connected load in kVA  
 $M_{eff}$  = effective motor torque in Nm  
 $n_{AV}$  = average motor speed in min-1  
 $F$  = factor for motor and drive efficiency and current form  
 $F$  = 1.75 with a three-phase connection  
 $F$  = 2.1 with a single-phase connection  
 0.125 = power consumption of the control unit voltage source in kVA



**The average motor speed for feed functions in transfer facilities is generally no greater than 25% of the rapid traverse speed.**

**In some cases, it may be necessary to precisely calculate average motor speed.**

### 3.3. Grounding Conditions

#### *Grounded threephase systems*

With the help of an autotransformer, voltages can be adapted to three-phase mains which is in reference to the ground (TN or TT mains). The DDC 1 can be directly connected to 3 x AC 220 V mains.

#### *Ungrounded threephase systems*

There is an increased danger in ungrounded mains (IT mains) that overvoltages will occur between the phases and the housing. The DDC 1 should only be operated with such systems, if:

- it is connected across an isolation transformer or
- if the installation is protected with an overvoltage conductor.



**Connecting the DDC 1.2 across an isolation transformer offers the best possible protection against overvoltage and the greatest operating safety!**

#### *Permissible overvoltage levels*

The voltage between phase connections (A, B and C) and the DDC 1.2 housing can equal 230 V (effective).

*Non-periodic overvoltages* as per VDE 0160 between phases and housing are acceptable for the DDC 1.2 to the extent as shown below:

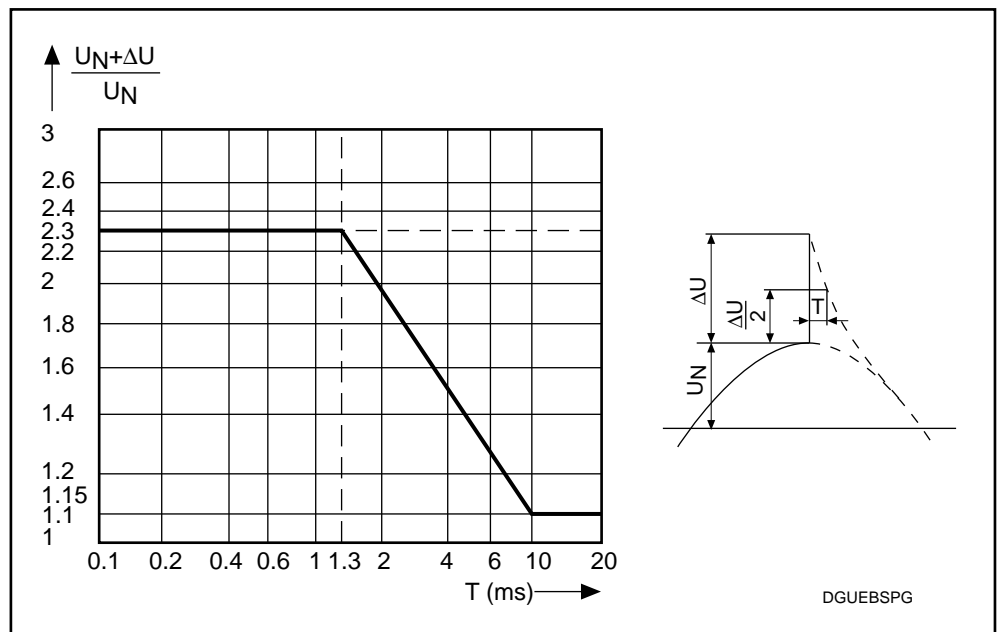


Fig. 3.3: Permissible non-periodic voltages as per VDE 0160

The DDC 1.2 can be connected to 3 x AC 230 V mains.  
The maximum permissible non-periodic overvoltage thus equals:

$$230\text{V} \cdot \sqrt{2} \cdot 2.3 = 745\text{V}$$



### 3.4. Power Connection cross sections and Fuses

The power connections of the DDC 1.2 can be protected with either power circuit breakers or slow-blo gL-type fuses.

#### *Fusing for three-phase connections*

The recommended fuse on the input side of the matching transformer with 3 x AC 400 V mains.

A power circuit breaker or slow-blow fuse is generally used on the input side of a matching transformer. The use of power circuits has the advantage that it is not possible to operate with two phases when one fuse is blown out.

The recommended fuses and line cross sections apply if INDRAMAT transformers are used. Make sure that the secondary lines are protected against short circuiting, in particular, if an isolation transformer with low-power is used.

| Transf. power in kVA | Current in A |         | Rec. power circ. breaker <sup>1)</sup><br>(motor circ. break.)<br>type Siemens | Tuning range in A | Tuning value in A | Rec. slow-blow fuse gL class |
|----------------------|--------------|---------|--|-------------------|-------------------|------------------------------|
|                      | primary      | second. |  |                   |                   |                              |
| 2.0                  | 2.9          | 5       | 3VU1300-.MK00  | 4 ... 6           | 4                 | 6A slow-blow                 |
| 2.5                  | 3.6          | 6.3     | 3VU1300-.ML00  | 6 ... 10          | 6                 | 10A slow-blow                |
| 3.5                  | 5.1          | 8.8     | 3VU1300-.MM00  | 10 ... 16         | 10                | 16A slow-blow                |
| 4.0                  | 5.8          | 10      | 3VU1300-.MM00  | 10 ... 16         | 10                | 16A slow-blow                |
| 5.0                  | 7.2          | 12.6    | 3VU1300-.MN00  | 14 ... 20         | 14                | 20A slow-blow                |
| 7.5                  | 10.8         | 18.8    | 3VU1300-.MP00  | 18 ... 25         | 18                | 20A slow-blow                |
| 10                   | 14.5         | 25.1    | 3VU1300-.MP00  | 18 ... 25         | 18                | 20A slow-blow                |
| 12.5                 | 18.1         | 31.4    | 3VU1600-.MP00  | 22 ... 32         | 27                | 25A slow-blow                |
| 15                   | 21.7         | 37.7    | 3VU1600-.MQ00  | 28 ... 40         | 32                | 25A slow-blow                |
| 18                   | 26.0         | 45.2    | 3VU1600-.MQ00  | 28 ... 40         | 39                | 35A slow-blow                |
| 20                   | 28.9         | 50.3    | 3VU1600-.MQ00  | 28 ... 40         | 40                | 35A slow-blow                |
| 25                   | 36.1         | 62.8    | 3VU1600-.MR00  | 36 ... 50         | 50                | 50A slow-blow                |

#### *Direct connection to 3 x AC 220 V mains*

Fuses on the secondary side of the matching transformer or if connected to 3x AC 220V mains.

If fuses are to be placed on the secondary side of the matching transformer or if the DDC is connected to 3 x 220 V mains, then select the fusing as per the current in the connecting cable, but not less than 16A (16 A slow-blow fuse or power circuit breaker 3VU1300-.MM00 ).

**1) Note the maximum size of the power circuit breaker as indicated by the manufacturer !**

*Cross section of the DDC 1 connecting cable*

Calculate the current in the connecting cable to determine cable cross section.

threephase connection

$$I_L = \frac{S_{AN}}{\sqrt{3} \cdot 230V}$$

$I_L$  = current in connecting lead indicated in A  
 $S_{AN}$  = connected load indicated in VA

The applicable guidelines must be followed when determining cable cross sections.

If fuses are placed on the input side only when transformers are used, then protect the secondary line against short-circuiting.

*Recommended cable for the DDC 1 connecting cable*

Ready-made INDRAMAT cables are available as connecting cables for the DDC 1.2 The recommended cable types and cross sections apply where INDRAMAT transformers and fuses are used.

The cable recommended in the following table has a current capacity as per EN 60 204 (VDE 0113) – E mode of installation.

*Recommended cable for three-phase connections*

| Drive controllers | Transf.- (conn.) load in kVA | Connector on drive | Recommended secondary cable with INDRAMAT autotransformers |            | Recommended secondary cable with INDRAMAT isolating transformers |            |
|-------------------|------------------------------|--------------------|--|------------|--|------------|
|                   |                              |                    | individual parts   | ready-made | individual parts   | ready-made |
| DDC 1.2-N050C     | 2 and 2.5                    | INS 108/02         | INK 250 (1.5mm <sup>2</sup> )                              | IKL 234    | INK 202 (2.5mm <sup>2</sup> )                                    | IKL 241    |
|                   | 3.5 and 4                    | INS 108/02         | INK 250 (1.5mm <sup>2</sup> )                              | IKL 234    | INK 204 (6mm <sup>2</sup> )                                      | request    |
|                   | 5                            | INS 108/02         | INK 250 (1.5mm <sup>2</sup> )                              | IKL 234    | INK 202 (2.5mm <sup>2</sup> )                                    | IKL 241    |
|                   | 7.5                          | INS 108/03         | INK 202 (2.5mm <sup>2</sup> )                              | IKL 241    | INK 202 (2.5mm <sup>2</sup> )                                    | IKL 241    |
| DDC 1.2-N...A     | 2 and 2.5                    | INS 172/25         | INK 202 (2.5mm <sup>2</sup> )                              | IKL 232    | INK 202 (2.5mm <sup>2</sup> )                                    | IKL 232    |
|                   | 3.5 and 4                    | INS 172/25         | INK 202 (2.5mm <sup>2</sup> )                              | IKL 232    | INK 204 (6mm <sup>2</sup> )                                      | IKL 243    |
|                   | 5 and 7.5                    | INS 172/25         | INK 202 (2.5mm <sup>2</sup> )                              | IKL 232    | INK 202 (2.5mm <sup>2</sup> )                                    | IKL 232    |
|                   | 10                           | INS 172/25         | INK 203 (4mm <sup>2</sup> )                                | IKL 242    | INK 203(4mm <sup>2</sup> )                                       | IKL 242    |
|                   | 12.5                         | INS 172/06         | INK 204 (6mm <sup>2</sup> )                                | IKL 243    | INK 204 (6mm <sup>2</sup> )                                      | IKL 243    |
|                   | 15.18 and 20                 | INS 172/10         | INK 205 (10mm <sup>2</sup> )                               | IKL 244    | INK 205 (10mm <sup>2</sup> )                                     | IKL 244    |
|                   | 25                           | INS 172/16         | INK 206 (16mm <sup>2</sup> )                               | IKL 245    | INK 206 (16mm <sup>2</sup> )                                     | IKL 245    |

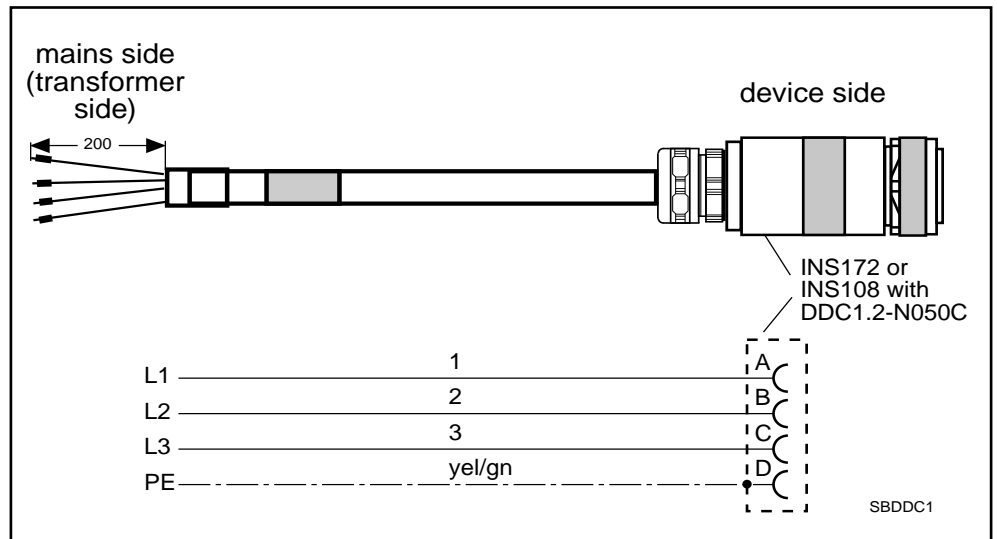


Fig. 3.4: Power supply cable for a DDC 1.2

### 3.5. Transformers

Transformers for installation in control cabinets (IP 00) and transformers in housing with protection category IP 55 are available for adapting the mains voltage to the DDC 1 connecting voltage.

*Autotransformers for installation in a control enclosure*

Autotransformers are preferred for adapting voltages (see section 3.3). Their protection category is IP 00, and their ambient temperature 40°C. See section 3.6 for available options.

*Isolating transformers for installation in a control enclosure*

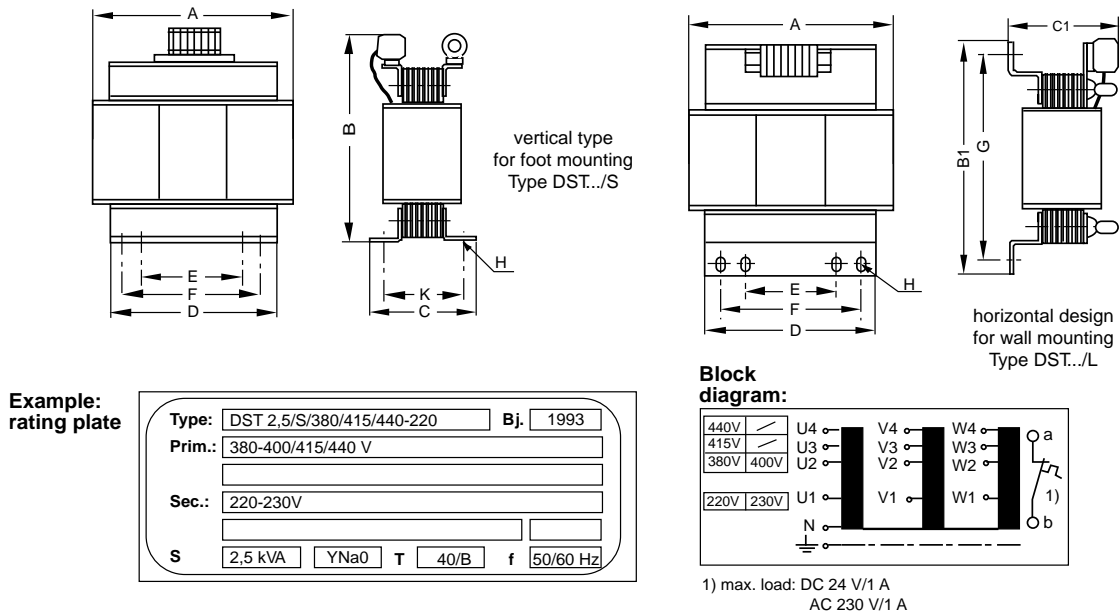
For special mains conditions, isolating transformers are recommended (see section 3.3). Protection category is IP 00; ambient temperature 40°C. See section 3.7 for available options.

*Autotransformers in IP 55 housing*

Autotransformers are preferably used for adapting voltages (see section 3.3). Transformers in the housing permit a decentralized installation. This decreases the power loss in the control cabinet.

If transformers are built into the housing, then the surface of the housing limits the acceptable loss of power. DST ... /G/ type transformers have been especially constructed with a high level of protection for operation within the housing. See section 3.8 for available options.

### 3.6. DST Three-Phase Autotransformers for Mounting in Control Enclosures



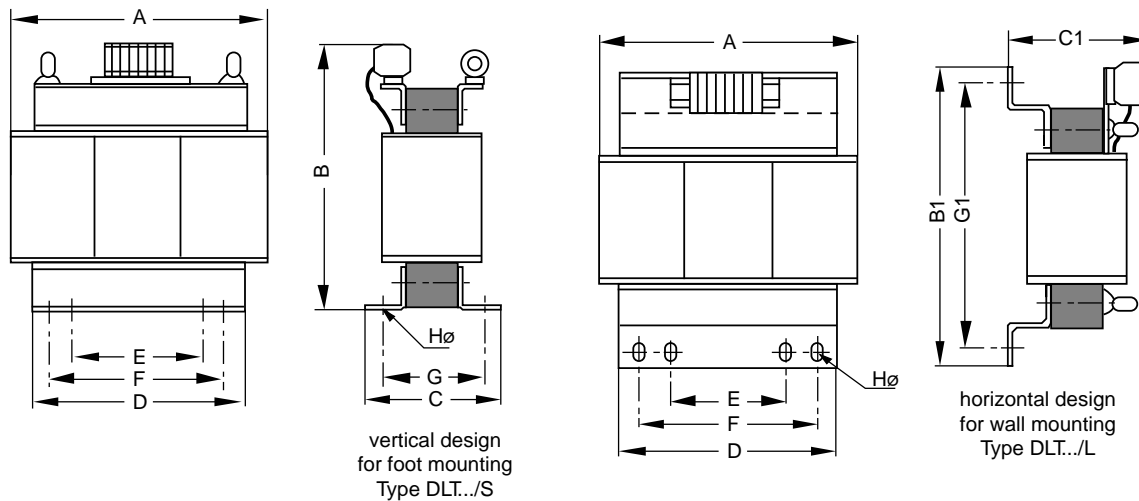
Dimensions and technical data for threephase autotransformers with  
 $U_{sec} = 220-230\text{ V}$ ;  $U_{pri} = 380-400\text{ V}, 415\text{ V}, 440\text{ V}, 460\text{ V}, 500\text{ V}, f = 50/60\text{ Hz}$

| Type designations<br>DST | Dimensions in mm |     |     |     |     |     |     |     |     |    |     | power<br>loss<br>in W | max. conn.<br>cross sections<br>in mm <sup>2</sup> | Wgt.<br>in kg |
|--------------------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----------------------|--|---------------|
|                          | A                | B   | B1  | C   | C1  | D   | E   | F   | G   | H  | K   |                       |  |               |
| 0.5/ • /380/415/440-220  | 150              | 165 | 170 | 75  | 80  | 125 | 70  | 100 | 154 | 6  | 55  | 30                    | 4  | 4             |
| 0.5/ • /380/460/500-220  | 150              | 165 | 170 | 90  | 95  | 125 | 70  | 100 | 154 | 6  | 70  | 40                    | 4  | 6             |
| 1.0/ • /380/415/440-220  | 180              | 190 | 205 | 105 | 100 | 125 | 80  | 125 | 185 | 7  | 75  | 45                    | 4  | 8.5           |
| 1.0/ • /380/460/500-220  | 180              | 190 | 205 | 115 | 100 | 150 | 80  | 125 | 185 | 7  | 85  | 55                    | 4  | 10            |
| 1.5/ • /380/415/440-220  | 180              | 190 | 205 | 115 | 110 | 150 | 80  | 125 | 185 | 7  | 85  | 55                    | 4  | 10            |
| 1.5/ • /380/460/500-220  | 205              | 210 | 235 | 120 | 110 | 150 | 95  | 145 | 209 | 7  | 85  | 75                    | 4  | 11.5          |
| 2.0/ • /380/415/440-220  | 205              | 210 | 235 | 120 | 110 | 170 | 95  | 145 | 209 | 7  | 85  | 80                    | 4  | 11.5          |
| 2.0/ • /380/460/500-220  | 240              | 260 | 270 | 120 | 135 | 200 | 110 | 170 | 240 | 11 | 90  | 90                    | 4  | 18            |
| 2.5/ • /380/415/440-220  | 240              | 260 | 270 | 120 | 135 | 200 | 110 | 170 | 240 | 11 | 90  | 95                    | 4  | 18            |
| 2.5/ • /380/460/500-220  | 240              | 260 | 270 | 140 | 155 | 200 | 110 | 170 | 240 | 11 | 110 | 110                   | 4  | 21            |
| 3.5/ • /380/415/440-220  | 240              | 260 | 270 | 140 | 155 | 200 | 110 | 170 | 240 | 11 | 110 | 125                   | 10   | 21            |
| 3.5/ • /380/460/500-220  | 240              | 260 | 270 | 150 | 165 | 200 | 110 | 170 | 240 | 11 | 120 | 130                   | 10   | 24.5          |
| 4.0/ • /380/415/440-220  | 240              | 260 | 270 | 150 | 165 | 200 | 110 | 170 | 240 | 11 | 120 | 140                   | 10   | 24.5          |
| 4.0/ • /380/460/500-220  | 240              | 260 | 270 | 155 | 170 | 200 | 110 | 170 | 240 | 11 | 125 | 150                   | 10   | 26            |
| 5.0/ • /380/415/440-220  | 240              | 260 | 270 | 155 | 170 | 200 | 110 | 170 | 240 | 11 | 125 | 160                   | 10   | 26            |
| 5.0/ • /380/460/500-220  | 300              | 325 | 340 | 140 | 165 | 250 | 140 | 210 | 310 | 11 | 110 | 180                   | 10   | 30.5          |
| 7.5/ • /380/415/440-220  | 300              | 325 | 340 | 155 | 180 | 250 | 140 | 210 | 310 | 11 | 125 | 200                   | 10   | 36            |
| 7.5/ • /380/460/500-220  | 300              | 325 | 340 | 165 | 195 | 250 | 140 | 210 | 310 | 11 | 135 | 230                   | 10   | 42            |
| 10/ • /380/415/440-220   | 300              | 325 | 340 | 180 | 205 | 250 | 140 | 210 | 310 | 11 | 150 | 245                   | 10   | 50            |
| 10/ • /380/460/500-220   | 300              | 325 | 340 | 195 | 220 | 250 | 140 | 210 | 310 | 11 | 165 | 250                   | 10   | 53            |
| 12.5/ • /380/415-220     | 300              | 325 | 340 | 195 | 225 | 250 | 140 | 210 | 310 | 11 | 165 | 260                   | 10   | 53            |
| 12.5/ • /440/460-220     | 335              | 365 | 380 | 195 | 225 | 280 | 160 | 230 | 350 | 11 | 160 | 270                   | 10   | 65            |
| 12.5/ • /500/525-220     | 335              | 365 | 380 | 195 | 225 | 280 | 160 | 230 | 350 | 11 | 160 | 285                   | 10   | 65            |
| 15/ • /380/415-220       | 335              | 365 | 380 | 195 | 225 | 280 | 160 | 230 | 350 | 11 | 160 | 290                   | 16   | 65            |
| 15/ • /440/460-220       | 360              | 395 | 400 | 190 | 215 | 300 | 170 | 250 | 370 | 11 | 160 | 305                   | 16   | 68            |
| 15/ • /500/525-220       | 360              | 395 | 400 | 190 | 215 | 300 | 170 | 250 | 370 | 11 | 160 | 310                   | 16   | 68            |
| 18/ • /380/415-220       | 360              | 395 | 400 | 190 | 215 | 300 | 170 | 250 | 370 | 11 | 160 | 330                   | 16   | 68            |
| 18/ • /440/460-220       | 360              | 395 | 400 | 205 | 230 | 300 | 170 | 250 | 370 | 11 | 175 | 350                   | 16   | 80            |
| 18/ • /500/525-220       | 360              | 395 | 400 | 205 | 230 | 300 | 170 | 250 | 370 | 11 | 175 | 375                   | 16   | 80            |
| 20/ • /380/415-220       | 360              | 395 | 400 | 190 | 215 | 300 | 170 | 250 | 370 | 11 | 160 | 380                   | 16   | 70            |
| 20/ • /440/460-220       | 360              | 395 | 400 | 205 | 230 | 300 | 170 | 250 | 370 | 11 | 175 | 395                   | 16   | 80            |
| 20/ • /500/525-220       | 420              | 450 | 460 | 215 | 210 | 350 | 190 | 280 | 420 | 14 | 165 | 430                   | 16   | 92            |
| 25/ • /380/415-220       | 420              | 450 |     | 215 |     | 350 | 190 | 280 |     | 14 | 165 | 450                   | 35   | 92            |
| 25/ • /440/460-220       | 420              | 450 |     | 215 |     | 350 | 190 | 280 |     | 14 | 165 | 470                   | 35   | 92            |
| 25/ • /500/525-220       | 420              | 450 |     | 245 |     | 350 | 190 | 280 |     | 14 | 195 | 490                   | 35   | 122           |
| 35/ • /380/415-220       | 420              | 450 |     | 245 |     | 350 | 190 | 280 |     | 14 | 195 | 540                   | 35   | 122           |
| 35/ • /440/460-220       | 420              | 450 |     | 245 |     | 350 | 190 | 280 |     | 14 | 195 | 630                   | 35   | 122           |
| 35/ • /500/525-220       | 420              | 450 |     | 275 |     | 350 | 190 | 280 |     | 14 | 225 | 670                   | 35   | 152           |
| 50/ • /380/415-220       | 420              | 450 |     | 275 |     | 350 | 190 | 280 |     | 14 | 225 | 720                   | 70   | 152           |
| 50/ • /440/460-220       | 580              | 540 |     | 255 |     | 550 | 270 | 400 |     | 18 | 205 | 790                   | 70   | 180           |
| 50/ • /500/525-220       | 580              | 540 |     | 265 |     | 550 | 270 | 400 |     | 18 | 215 | 850                   | 70   | 195           |

MBDST

Fig. 3.5: DST - threephase autotransformers dimensional data

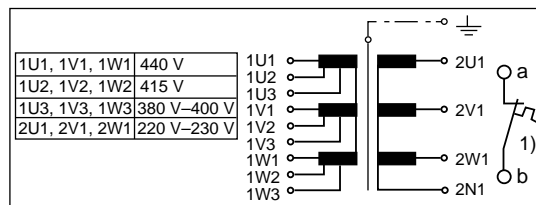
### 3.7. DLT Three-Phase Isolating Transformers for Mounting in Control Enclosures



Example: rating plate

|        |                           |      |                   |
|--------|---------------------------|------|-------------------|
| Type:  | DLT 2,5/S/380/415/440-220 | Bj.  | 1993              |
| Prim.: | 380-400/415/440 V         |      |                   |
| Sec.:  | 220-230V                  |      |                   |
| S      | 2,5 kVA                   | Yyn0 | T 40/B f 50/60 Hz |

Block diagram:



1) Maximum load: DC 24 V/1 A; AC 230 V/1 A

Dimensions and technical data for threephase isolating transformers with  
 $U_{sec} = 220-230 \text{ V}$ ;  $U_{pri} = 380-400 \text{ V}, 415 \text{ V}, 440 \text{ V}, 460 \text{ V}, 500 \text{ V}, f = 50/60 \text{ Hz}$

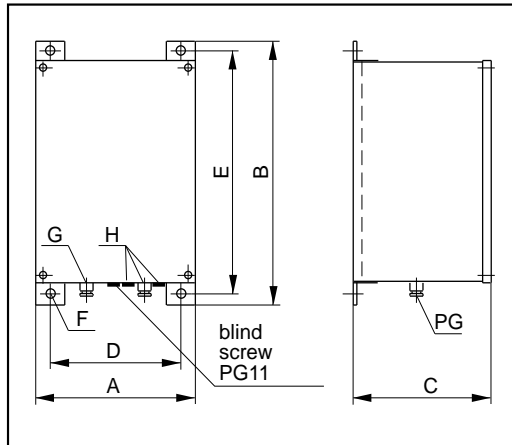
| Type designations<br>DLT | Dimensions in mm |     |     |     |     |     |     |     |     |     |    | power<br>loss<br>in W | max. conn.<br>cross sections<br>in mm <sup>2</sup> | Wgt.<br>in kg |
|--------------------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----------------------|--|---------------|
|                          | A                | B   | B1  | C   | C1  | D   | E   | F   | G   | G1  | H  |                       |  |               |
| 0.5/•/380/415/440-220    | 180              | 190 | 205 | 105 | 100 | 150 | 80  | 125 | 75  | 185 | 7  | 65                    | 4  | 8.5           |
| 0.5/•/380/460/500-220    | 180              | 190 | 205 | 105 | 100 | 150 | 80  | 125 | 75  | 185 | 7  | 70                    | 4  | 8.5           |
| 1.0/•/380/415/440-220    | 205              | 210 | 235 | 130 | 120 | 170 | 95  | 145 | 95  | 209 | 7  | 120                   | 4  | 13            |
| 1.0/•/380/460/500-220    | 205              | 210 | 235 | 130 | 120 | 170 | 95  | 145 | 95  | 209 | 7  | 140                   | 4  | 13            |
| 1.5/•/380/415/440-220    | 240              | 260 | 270 | 140 | 155 | 200 | 110 | 170 | 110 | 240 | 11 | 155                   | 4  | 21            |
| 1.5/•/380/460/500-220    | 240              | 260 | 270 | 140 | 155 | 200 | 110 | 170 | 110 | 240 | 11 | 165                   | 4  | 21            |
| 2.0/•/380/415/440-220    | 240              | 260 | 270 | 150 | 165 | 200 | 110 | 170 | 120 | 240 | 11 | 180                   | 4  | 24.5          |
| 2.0/•/380/460/500-220    | 240              | 260 | 270 | 150 | 165 | 200 | 110 | 170 | 120 | 240 | 11 | 195                   | 4  | 24.5          |
| 2.5/•/380/415/440-220    | 300              | 325 | 340 | 140 | 165 | 250 | 140 | 210 | 110 | 310 | 11 | 220                   | 4  | 30.5          |
| 2.5/•/380/460/500-220    | 300              | 325 | 340 | 140 | 165 | 250 | 140 | 210 | 110 | 310 | 11 | 235                   | 4  | 30.5          |
| 4.0/•/380/415/440-220    | 300              | 325 | 340 | 165 | 195 | 250 | 140 | 210 | 135 | 310 | 11 | 240                   | 10   | 42            |
| 4.0/•/380/460/500-220    | 300              | 325 | 340 | 165 | 195 | 250 | 140 | 210 | 135 | 310 | 11 | 265                   | 10   | 42            |
| 5.0/•/380/415/440-220    | 335              | 365 | 380 | 175 | 210 | 280 | 160 | 230 | 145 | 350 | 11 | 300                   | 10   | 55            |
| 5.0/•/380/460/500-220    | 335              | 365 | 380 | 175 | 210 | 280 | 160 | 230 | 145 | 350 | 11 | 350                   | 10   | 55            |
| 7.5/•/380/415/440-220    | 360              | 395 | 400 | 190 | 215 | 300 | 170 | 250 | 160 | 370 | 11 | 375                   | 10   | 70            |
| 7.5/•/380/460/500-220    | 360              | 395 | 400 | 190 | 215 | 300 | 170 | 250 | 160 | 370 | 11 | 395                   | 10   | 70            |
| 10/•/380/415/440-220     | 360              | 395 | 400 | 205 | 230 | 300 | 170 | 250 | 175 | 370 | 11 | 500                   | 10   | 85            |
| 10/•/380/460/500-220     | 360              | 395 | 400 | 205 | 230 | 300 | 170 | 250 | 175 | 370 | 11 | 510                   | 10   | 85            |
| 15/•/380-220             | 420              | 450 |     | 245 |     | 350 | 190 | 280 | 195 |     | 16 | 600                   | 16   | 122           |
| 20/•/380-220             | 420              | 450 |     | 275 |     | 400 | 190 | 280 | 225 |     | 16 | 800                   | 35   | 152           |
| 25/•/380-220             | 580              | 540 |     | 255 |     | —   | 270 | 400 | 205 |     | 18 | 875                   | 35   | 180           |
| 35/•/380-220             | 660              | 590 |     | 295 |     | —   | 270 | 480 | 245 |     | 18 | 1000                  | 70   | 275           |
| 50/•/380-220             | 660              | 655 |     | 305 |     | —   | 270 | 480 | 255 |     | 18 | 1170                  | 70   | 320           |

MBDLT

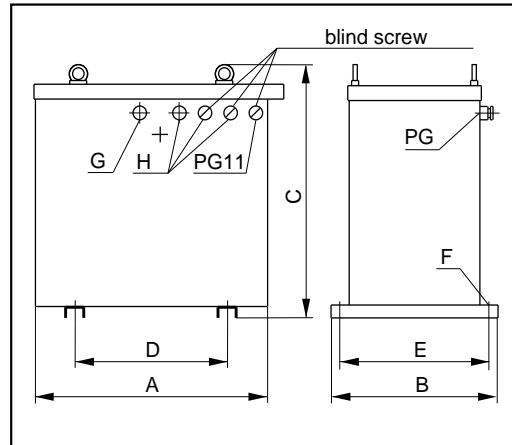
Fig. 3.6: DLT - threephase isolating transformers dimensional data

### 3.8. Three-Phase Autotransformers in IP 55 Housing

If transformers are to be mounted into housing, then this must be taken into consideration during planning. Due to the limit heat dissipation via the relatively small housing surface it is possible for standard transformers to reach unacceptably high temperature levels. Transformers of the type DST../G/ have been especially with a higher protection level for mounting into housing.



autotransformers with housing up to 5 kVA

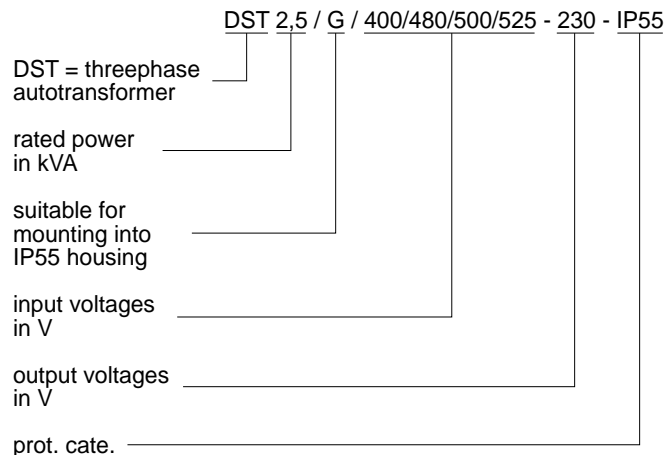


autotransformers with housing from 10 to 25 kVA

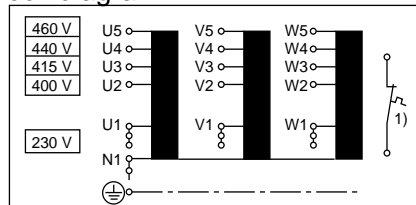
#### Technical data

as per DIN/VDE 0550 and 0532  
steel plate housing - prot. category IP 55  
powder coating in RAL 7032  
connection symbol: YNa0  
frequency: 50/60 Hz  
insulation class: T 40/F  
temperature contact: AC1A/250V/DC24V  
Resin coat for protection against corrosion  
individual items checked by VDE/IEC

#### Type codes



#### Block diagram



1) max. load: DC 24 V / 1 A  
AC 230 V / 1 A

#### Available types

| Type Codes<br>DST ../G/  | Dimensions in mm |     |     |     |     |    | G<br>Pg<br>cable ø | H<br>Pg<br>cable ø | Weight<br>in kg | Maximum conn.<br>cross sections<br>in mm <sup>2</sup> |
|--|------------------|-----|-----|-----|-----|----|--------------------|--------------------|-----------------|---|
|  | A                | B   | C   | D   | E   | Fø |                    |                    |                 |   |
| 2,5/G/400/415/440/460-230-IP55<br>2.5/G/400/480/500/525-230-IP55 | 300              | 445 | 235 | 250 | 415 | 12 | 16<br>10...14      | 21<br>14...18      | 33.5            | 4   |
| 5.0/G/400/415/440/460-230-IP55<br>5.0/G/400/480/500/525-230-IP55 | 375              | 570 | 235 | 300 | 540 | 12 | 16<br>10...14      | 21<br>14...18      | 54              | 10  |
| 10/G/400/415/440/460-230-IP55<br>10/G/400/480/500/525-230-IP55   | 490              | 400 | 500 | 250 | 370 | 16 | 16<br>10...14      | 21<br>17...19      | 100             | 10  |
| 15/G/400/415/440/460-230-IP55<br>15/G/400/480/500/525-230-IP55   | 595              | 480 | 600 | 280 | 440 | 16 | 21<br>14...18      | 29<br>18...25      | 135             | 16  |
| 25/G/400/415/440/460-230-IP55<br>25/G/400/480/500/525-230-IP55   | 595              | 480 | 600 | 280 | 440 | 16 | 29<br>18...25      | 36<br>25...33      | 200             | 35  |

Fig. 3.7: Dimensions and data of 3-phase autotransformers (prot. cat. IP 55)

### 3.9. Motor Power Connection

#### Ready-made cables

Ready-made cables are available for motor power connections. The motor power cable can be made available in individual parts upon request.

#### Maximum cable length

If INDRAMAT motor power cables are used, then maximum cable length is 75 meters.



**When operating the DDC 1.2 in residential and light-industrial areas, it may be necessary to shield the motor power cable to maintain the values for radio interference transmission (rf interference suppression).**

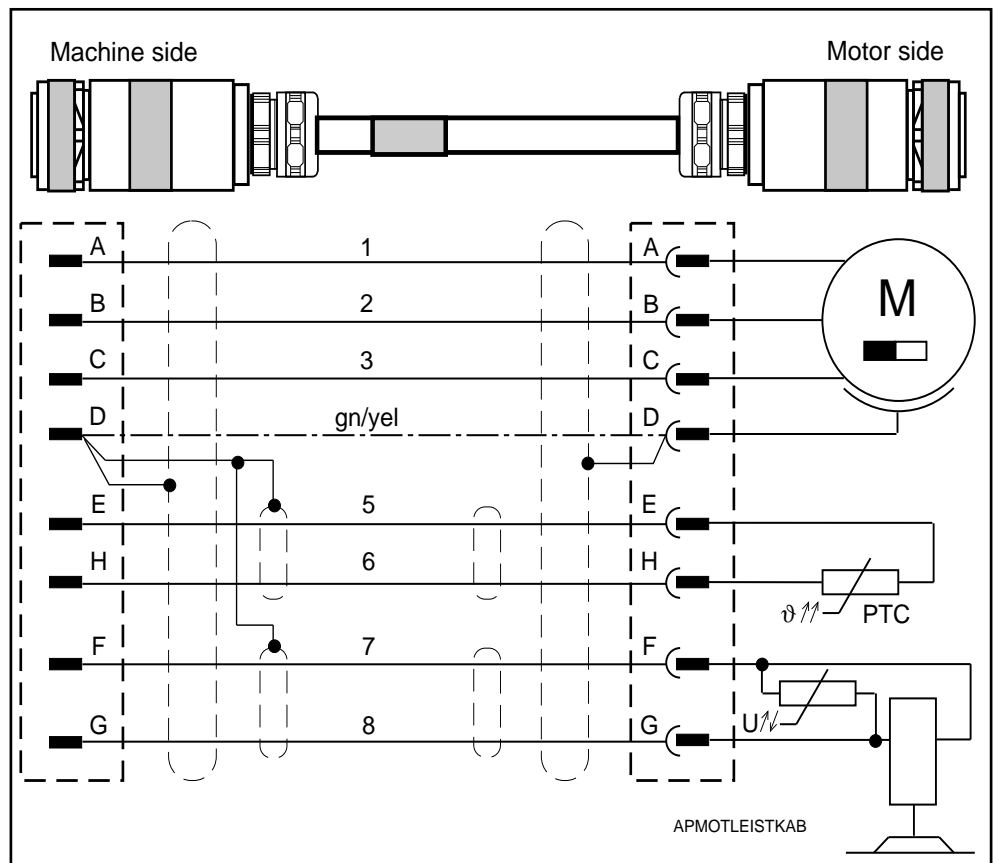


Fig. 3.8: A shielded motor power cable



**The motor power connector controls the holding brakes of the MDD motors. The holding brake has not been designed to function as a working brake. It wears down after approximately 20,000 revolutions against the closed brake.**

### Motor power cable capacity

The following recommended cable types and cross sections are based on the current load capacity listed per EN 60 204 (VDE 0113) – E mode of installation.

If other standards are required for the actual application, or if cables are routed to accommodate a different installation mode, then greater cable cross sections may be needed.

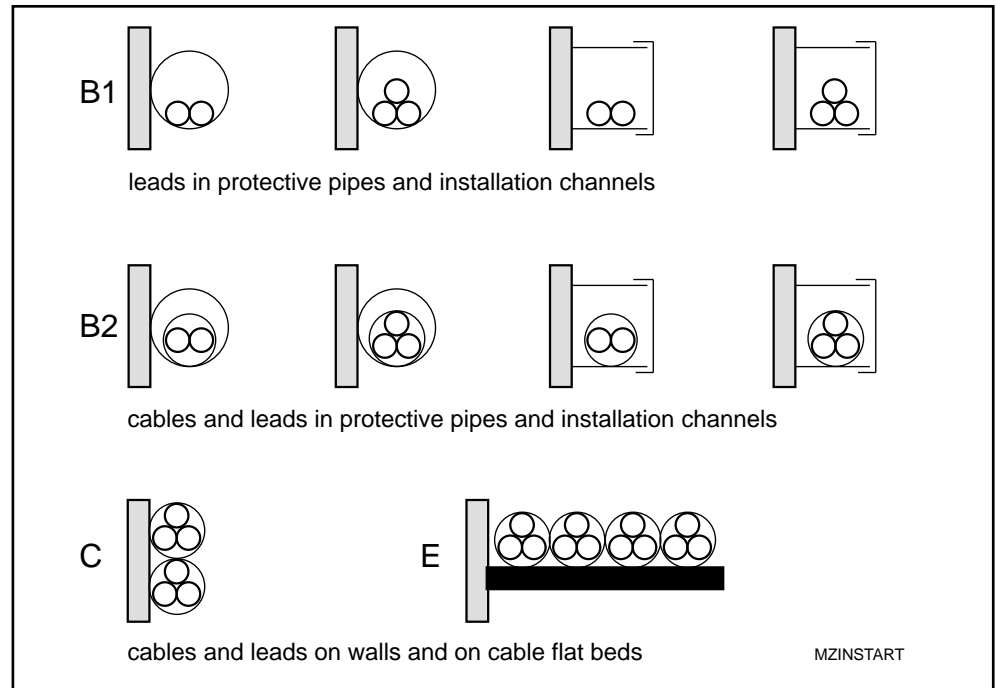


Fig. 3.9: Modes of installation as per EN 60204

| cross sections<br>in mm <sup>2</sup> | Current load as per EN 60 204<br>in A |                         |                        |                        |
|--------------------------------------|---------------------------------------|-------------------------|------------------------|------------------------|
|                                      | Installation<br>mode B1               | Installation<br>mode B2 | Installation<br>mode C | Installation<br>mode E |
| 1.5                                  | 13.5                                  | 12.2                    | 15.2                   | 16.1                   |
| 2.5                                  | 18.3                                  | 16.5                    | 21                     | 22                     |
| 4                                    | 25                                    | 23                      | 28                     | 30                     |
| 6                                    | 32                                    | 29                      | 36                     | 37                     |
| 10                                   | 44                                    | 40                      | 50                     | 52                     |
| 16                                   | 60                                    | 53                      | 66                     | 70                     |
| 25                                   | 77                                    | 67                      | 84                     | 88                     |



## Recommended INDRAMAT Motor Power Cables

| Motor type<br>MDD... | DDC 1.2 | connector on<br>motor INS 3) | connector on<br>unit INS 3) | INDRAMAT Cable for Motors Without Cooling |  |  |                                |
|----------------------|---------|------------------------------|-----------------------------|---|--|--|--------------------------------|
|                      |         |                              |                             | motor phase<br>current<br><br>in A        | cross<br>sections<br>in<br>mm <sup>2</sup> | individual<br>parts 1)<br>INK2...<br>INK6... | ready<br>made<br>IK. ...<br>2) |
| 21...                | -N050C  | 252                          | 110                         | max.1.3                                   | 1.5  | 250  | 027                            |
| 25...                |         | 252                          | 110                         | max.3.2                                   | 1.5  | 250  | 027                            |
| 41...                |         | 252                          | 110                         | max.8.4                                   | 1.5  | 250  | 027                            |
| 65A-N-040            |         | 252                          | 110                         | 1.5                                       | 1.5  | 250  | 027                            |
| 65A-N-060            |         | 252                          | 110                         | 2.1                                       | 1.5  | 250  | 027                            |
| 65B-N-040            |         | 252                          | 110                         | 2.9                                       | 1.5  | 250  | 027                            |
| 65B-N-060            |         | 252                          | 110                         | 4.8                                       | 1.5  | 250  | 027                            |
| 65C-N-040            |         | 252                          | 110                         | 4.5                                       | 1.5  | 250  | 027                            |
| 65C-N-060            |         | 252                          | 110                         | 6.4                                       | 1.5  | 250  | 027                            |
| 65D-N-040            |         | 252                          | 110                         | 5.2                                       | 1.5  | 250  | 027                            |
| 65D-N-060            |         | 252                          | 110                         | 8.4                                       | 1.5  | 250  | 027                            |
| 71A-N-030            | -N050C  | 252                          | 110                         | 3   | 1.5  | 250  | 027                            |
| 71A-N-040            |         | 252                          | 110                         | 4.1                                       | 1.5  | 250  | 027                            |
| 71A-N-060            |         | 252                          | 110                         | 6.1                                       | 1.5  | 250  | 027                            |
| 71B-N-030            |         | 252                          | 110                         | 6   | 1.5  | 250  | 027                            |
| 71B-N-040            |         | 108                          | 110                         | 9   | 1.5  | 250  | 024                            |
| 71B-N-060            |         | 108                          | 110                         | 12.3                                      | 1.5  | 250  | 024                            |
| 71C-N-030            |         | 108                          | 110                         | 8.8                                       | 1.5  | 250  | 024                            |
| 71C-N-040            |         | 108                          | 110                         | 12  | 1.5  | 250  | 024                            |
| 71C-N-060            |         | 108                          | 110                         | 18  | 2.5  | 202  | 044                            |
| 90A-N-020            | -N050C  | 252                          | 110                         | 3.3                                       | 1.5  | 250  | 027                            |
| 90A-N-030            |         | 252                          | 110                         | 5.1                                       | 1.5  | 250  | 027                            |
| 90A-N-040            |         | 252                          | 110                         | 7.7                                       | 1.5  | 250  | 027                            |
| 90B-N-020            |         | 252                          | 110                         | 6.8                                       | 1.5  | 250  | 027                            |
| 90B-N-030            |         | 108                          | 110                         | 10.3                                      | 1.5  | 250  | 024                            |
| 90B-N-040            |         | 108                          | 110                         | 13.7                                      | 1.5  | 250  | 024                            |
| 90C-N-020            |         | 108                          | 110                         | 9.8                                       | 1.5  | 250  | 024                            |
| 90C-N-030            |         | 108                          | 110                         | 15.9                                      | 1.5  | 250  | 024                            |
| 90C-N-040            |         | 108                          | 110                         | 19.9                                      | 2.5  | 202  | 044                            |
| 93A-N-020            | -N050C  | 108                          | 110                         | 8.3                                       | 1.5  | 250  | 024                            |
| 93A-N-030            |         | 108                          | 110                         | 14.5                                      | 1.5  | 250  | 024                            |
| 93A-N-040            |         | 108                          | 110                         | 19  | 2.5  | 202  | 044                            |
| 93B-N-020            |         | 108                          | 110                         | 13.8                                      | 1.5  | 250  | 024                            |
| 93B-N-030            |         | 108                          | 110                         | 19.6                                      | 2.5  | 202  | 044                            |
| 93C-N-020            |         | 108                          | 110                         | 17.5                                      | 2.5  | 202  | 044                            |
| 93C-N-030            |         | 108                          | 110                         | 26.3                                      | 4  | 203  | 064                            |
| 112A-N-015           | -N050C  | 108                          | 110                         | 6.8                                       | 1.5  | 250  | 024                            |
| 112A-N-020           |         | 108                          | 110                         | 9.7                                       | 1.5  | 250  | 024                            |
| 112A-N-030           |         | 108                          | 110                         | 14.1                                      | 1.5  | 250  | 024                            |
| 112A-N-040           |         | 108                          | 110                         | 18.8                                      | 2.5  | 202  | 044                            |
| 112B-N-015           |         | 108                          | 110                         | 12.1                                      | 1.5  | 250  | 024                            |
| 112B-N-020           |         | 108                          | 110                         | 17  | 2.5  | 202  | 044                            |
| 112B-N-030           |         | 108                          | 110                         | 22.9                                      | 4  | 203  | 064                            |
| 112C-N-015           |         | 108                          | 110                         | 18.2                                      | 2.5  | 202  | 044                            |
| 112C-N-020           |         | 108                          | 110                         | 24.3                                      | 4  | 203  | 064                            |
| 112D-N-015           |         | 108                          | 110                         | 24.2                                      | 4  | 203  | 064                            |
| 115A-N-015           | -N050C  | 108                          | 110                         | 17  | 2.5  | 202  | 044                            |
| 115A-N-020           |         | 108                          | 110                         | 22.7                                      | 4  | 203  | 064                            |
| 115A-N-030           |         | 108                          | 110                         | 22.1                                      | 4  | 203  | 064                            |

1) INK 2.. for standard, individual cable parts, INK 6.. for individual, shielded cable parts.

2) IKL... for standard, ready made cables, IKG... for shielded, ready-made cables.

3) For a complete list of all connector types see "Connecting accessories for INDRAMAT drives".

## Recommended INDRAMAT Motor Power Cables

| Motor type<br>MDD... | DDC 1.2 | connector on<br>motor INS 3) | connector on<br>unit INS 3) | INDRAMAT Cable for Motors With Cooling |  |  |                                |
|----------------------|---------|------------------------------|-----------------------------|--|--|--|--------------------------------|
|                      |         |                              |                             | motor phase<br>current<br>in A         | cross<br>sections<br>in<br>mm <sup>2</sup> | individual<br>parts 1)<br>INK2...<br>INK4... | ready<br>made<br>IK. ...<br>2) |
| 71B-N-040            | -N...A  | 108                          | 217                         | 9                                      | 2.5  | 202  | 050                            |
| 71B-N-060            |         | 108                          | 217                         | 12.3                                   | 2.5  | 202  | 050                            |
| 71C-N-030            |         | 108                          | 217                         | 8.8                                    | 2.5  | 202  | 050                            |
| 71C-N-040            |         | 108                          | 217                         | 12                                     | 2.5  | 202  | 050                            |
| 71C-N-060            |         | 108                          | 217                         | 18                                     | 2.5  | 202  | 050                            |
| 90B-N-030            | -N...A  | 108                          | 217                         | 10.3                                   | 2.5  | 202  | 024                            |
| 90B-N-040            |         | 108                          | 217                         | 13.7                                   | 2.5  | 202  | 024                            |
| 90C-N-020            |         | 108                          | 217                         | 9.9                                    | 2.5  | 202  | 024                            |
| 90C-N-030            |         | 108                          | 217                         | 15.9                                   | 2.5  | 202  | 024                            |
| 90C-N-040            |         | 108                          | 217                         | 19.9                                   | 2.5  | 202  | 044                            |
| 93A-N-020            | -N...A  | 108                          | 217                         | 8.3                                    | 2.5  | 202  | 050                            |
| 93A-N-030            |         | 108                          | 217                         | 14.5                                   | 2.5  | 202  | 050                            |
| 93A-N-040            |         | 108                          | 217                         | 19                                     | 2.5  | 202  | 050                            |
| 93A-N-060            |         | 172                          | 217                         | 30.1                                   | 6  | 204  | 103                            |
| 93B-N-020            |         | 108                          | 217                         | 13.8                                   | 2.5  | 202  | 050                            |
| 93B-N-030            |         | 108                          | 217                         | 19.6                                   | 2.5  | 202  | 050                            |
| 93B-N-040            |         | 172                          | 217                         | 29.9                                   | 6  | 204  | 103                            |
| 93B-N-060            |         | 172                          | 217                         | 38.2                                   | 10   | 205  | 123                            |
| 93C-N-020            |         | 108                          | 217                         | 17.5                                   | 2.5  | 202  | 050                            |
| 93C-N-030            |         | 108                          | 217                         | 26.3                                   | 4  | 203  | 068                            |
| 93C-N-040            |         | 172                          | 217                         | 37                                     | 10   | 205  | 123                            |
| 93C-N-060            |         | 172                          | 217                         | 53.2                                   | 16   | 206  | 143                            |
| 112A-N-015           | -N...A  | 108                          | 217                         | 6.8                                    | 2.5  | 202  | 050                            |
| 112A-N-020           |         | 108                          | 217                         | 9.7                                    | 2.5  | 202  | 050                            |
| 112A-N-030           |         | 108                          | 217                         | 14.1                                   | 2.5  | 202  | 050                            |
| 112A-N-040           |         | 108                          | 217                         | 18.8                                   | 2.5  | 202  | 050                            |
| 112B-N-015           |         | 108                          | 217                         | 12.1                                   | 2.5  | 202  | 050                            |
| 112B-N-020           |         | 108                          | 217                         | 17                                     | 2.5  | 202  | 050                            |
| 112B-N-030           |         | 108                          | 217                         | 22.9                                   | 4  | 203  | 068                            |
| 112B-L-030           |         | 172                          | 217                         | 22.9                                   | 6  | 204  | 103                            |
| 112B-N-040           |         | 172                          | 217                         | 33.9                                   | 6  | 204  | 103                            |
| 112C-N-015           |         | 108                          | 217                         | 18.2                                   | 2.5  | 202  | 050                            |
| 112C-N-020           |         | 108                          | 217                         | 24.3                                   | 4  | 203  | 068                            |
| 112C-L-020           |         | 172                          | 217                         | 24.3                                   | 6  | 204  | 103                            |
| 112C-N-030           |         | 172                          | 217                         | 35.4                                   | 6  | 204  | 103                            |
| 112C-N-040           |         | 172                          | 217                         | 47.5                                   | 10   | 205  | 123                            |
| 112D-N-015           |         | 108                          | 217                         | 24.2                                   | 4  | 203  | 068                            |
| 112D-L-015           |         | 172                          | 217                         | 24.2                                   | 6  | 204  | 103                            |
| 112D-N-020           |         | 172                          | 217                         | 35.8                                   | 6  | 204  | 103                            |
| 112D-N-030           |         | 172                          | 217                         | 49.5                                   | 10   | 205  | 123                            |
| 115A-N-015           | -N...A  | 108                          | 217                         | 17                                     | 2.5  | 202  | 050                            |
| 115A-N-020           |         | 108                          | 217                         | 22.7                                   | 4  | 203  | 068                            |
| 115A-L-020           |         | 172                          | 217                         | 22.7                                   | 6  | 204  | 103                            |
| 115A-N-030           |         | 172                          | 217                         | 34.6                                   | 6  | 204  | 103                            |
| 115B-N-015           |         | 108                          | 217                         | 22.1                                   | 4  | 203  | 068                            |
| 115B-L-015           |         | 172                          | 217                         | 22.1                                   | 6  | 204  | 103                            |
| 115B-N-020           |         | 172                          | 217                         | 34.6                                   | 6  | 204  | 103                            |
| 115B-N-030           |         | 172                          | 217                         | 66.8                                   | 16   | 206  | 143                            |
| 115C-N-015           |         | 172                          | 217                         | 32.8                                   | 6  | 204  | 103                            |
| 115C-N-020           |         | 172                          | 217                         | 42.1                                   | 10   | 205  | 123                            |
| 115C-N-030           |         | 172                          | 217                         | 62.9                                   | 16   | 206  | 143                            |
| 115D-N-015           |         | 172                          | 217                         | 31.5                                   | 6  | 204  | 103                            |
| 115D-N-020           |         | 172                          | 217                         | 62.9                                   | 16   | 206  | 143                            |

1) INK 2.. for standard, individual cable parts, INK 6.. for individual, shielded cable parts.

2) IKL... for standard, ready made cables, IKG... for shielded, ready-made cables.

3) For a complete list of all connector types see "Connecting accessories for INDRAMAT drives".

### 3.10. Motor Feedback Connection

#### Feedback Connection

The feedback connections for motors with digital servo feedback (DSF) and resolver feedback (RSF) are built into cable leadthroughs inside the DDC 1, at terminal X4 (see section 4). Ready-made cables are also available.



**MDD motors with digital servo feedback can only be operated with DDC 1.2-.....-D...-XX and motors with resolver feedback only with DDC 1.2-.....-R...-XX units.**



**Only those motor/drive combinations listed in the configuration sheets may be operated together.**

#### Maximum cable length

Maximum cable length is 75 meters if INDRAMAT feedback cables are used.

#### Connector assignments for DSF and RSF

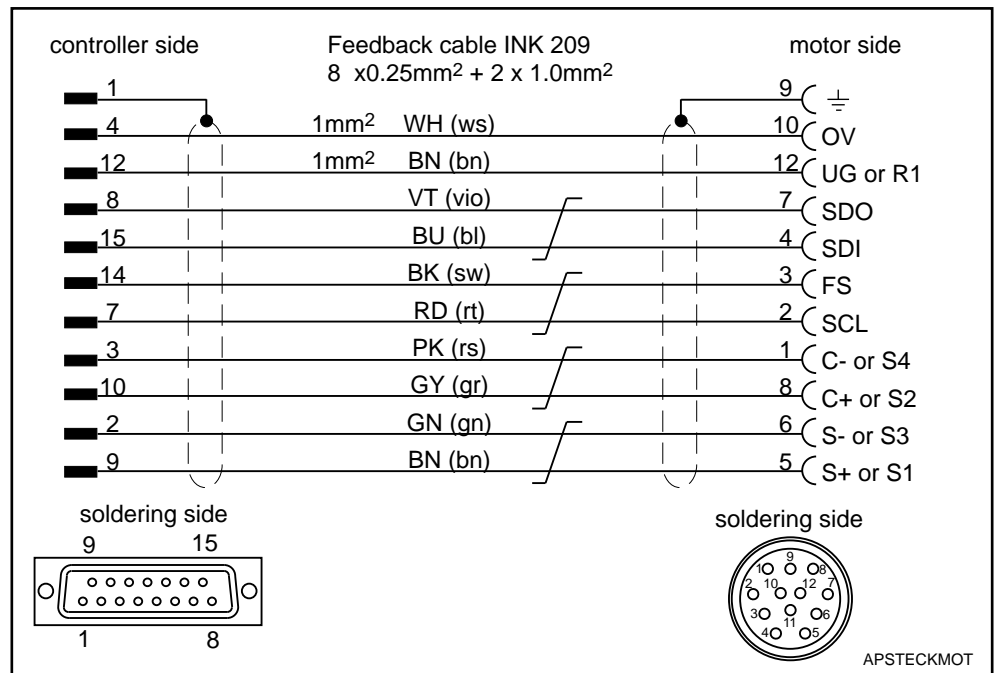


Fig. 3.10: Motor feedback terminal assignments

#### Ready-made INDRAMAT feedback cables for MDD motors

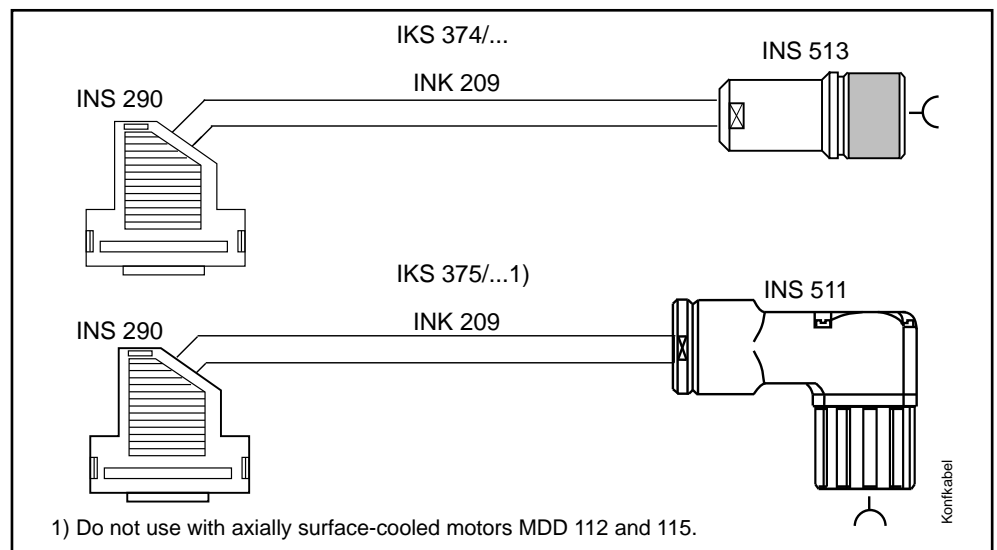


Fig. 3.11: Ready-made INDRAMAT feedback cables

### 3.11. Interface to NC Control Unit

**Ready-made cable** Interface X8 connects the DDC to the machine control unit. Ready-made cable, IKS083, is available for this purpose.

**Maximum cable length** Maximum cable length is 20 meters if ready-made cable IKS 083 is used.

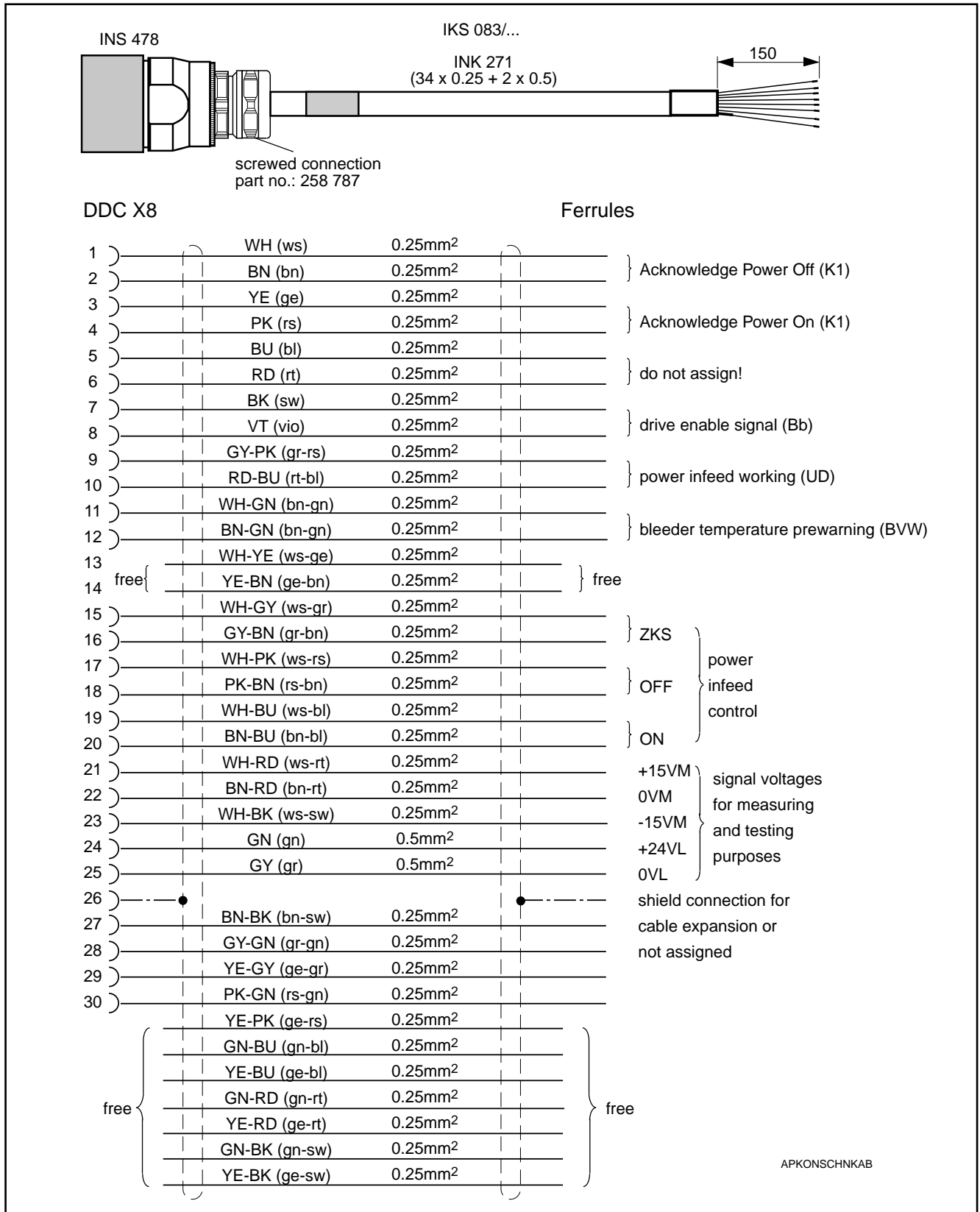


Fig. 3.12: Ready-made interface cable IKS 083

### 3.12. Control Circuit of the DDC Mains Contactor

The general operating method as suggested by INDRAMAT is to control the mains contactor and dynamic braking in the DDC. Selection of the control method and its effects will depend on the functions offered and the responses of the entire system. It is, therefore, the responsibility of the machine builder.

*Standstill with fault in  
drive electronics with/  
without DC bus  
dynamic braking*

**With dynamic braking**, synchronous motors are always braked to a standstill (MAC or MDD) whether electronic circuitry in the drive is still operational or not. The dynamic brake functions as an **additional protective device** for the machine.

Inductance motors (2AD or 1MB) are not braked when the DC bus is short-circuited.

**Without dynamic braking**, properly functioning drives can be braked at maximum torque. However, if there is trouble in the closed-loop electronic control system or if there is a discontinuity in the feedback line, it should be expected that drives will coast without electrical braking. Dynamic braking can only be eliminated when non-braked deceleration does not damage the system. As an alternative, motors equipped with mechanical holding brakes can be used.



**How to stop the drive in the event of a fault will depend on the functions offered on the system. In the final analysis, this decision can only be reached by the system designer. Thus, the following recommended is intended only as a guide to the system designer.**

### 3.13. Control Circuit in the DDC with Dynamic Braking

**Application** This control circuit should be selected if a synchronous motor, e.g., MDD, is connected to the DDC.

**Features** Dynamic braking always brakes synchronous motors to a standstill whether or not the drive electronics are operational. The DC bus is only short-circuited with a drive fault.

In the event of an emergency stop (E-stop) or a disconnect, the drives are braked to a standstill at maximum torque by the drive electronics.

**Operating principle** If the ON button is pressed, then auxiliary relays K3 and K4 switch mains contactor K1 on. Should K3 or K4 fail, then power cannot be switched on.

If the E-stop button is pressed, then K3 and K4 safely switch off mains contactor K1. The NC control unit of the machine must simultaneously lock out the **drive enable** (RF input with analog interface, E-STOP input of a DEA with a DLC single axis positioning module). The command value of the drive is then switched to zero. There is a controlled braking of the drive.

A drive error signal from the Bb contact of the DDC, an error signal from the controller (servo error) or an overtravelling of the limit switch disconnects the mains contactor and triggers dynamic braking.

The signal sequence as depicted in the diagram below is recommended for commissioning the DDC.

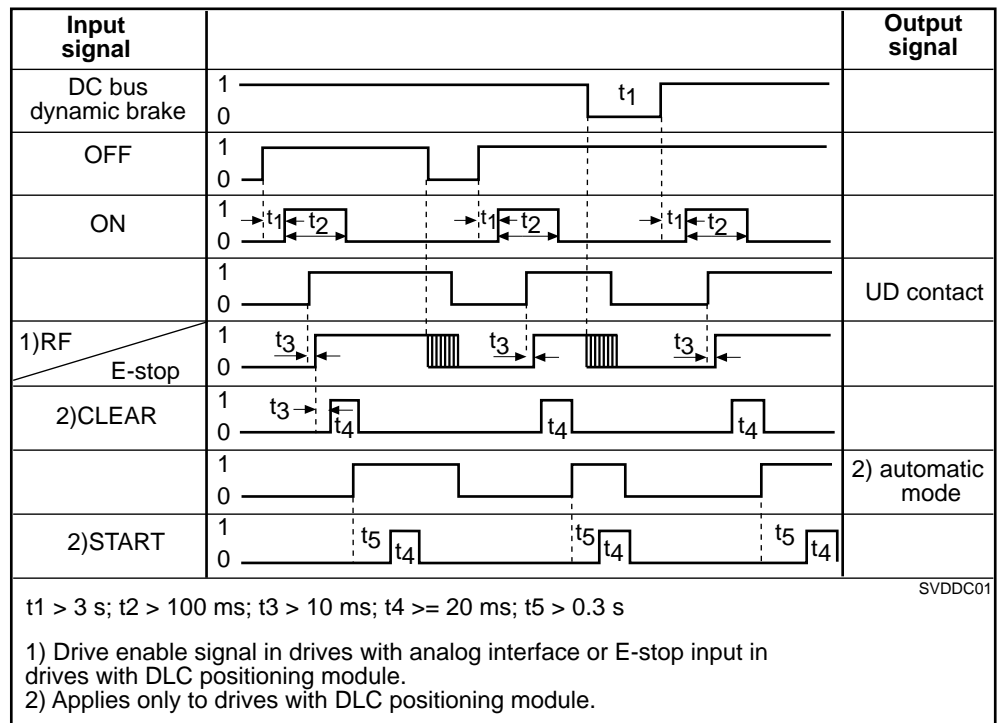
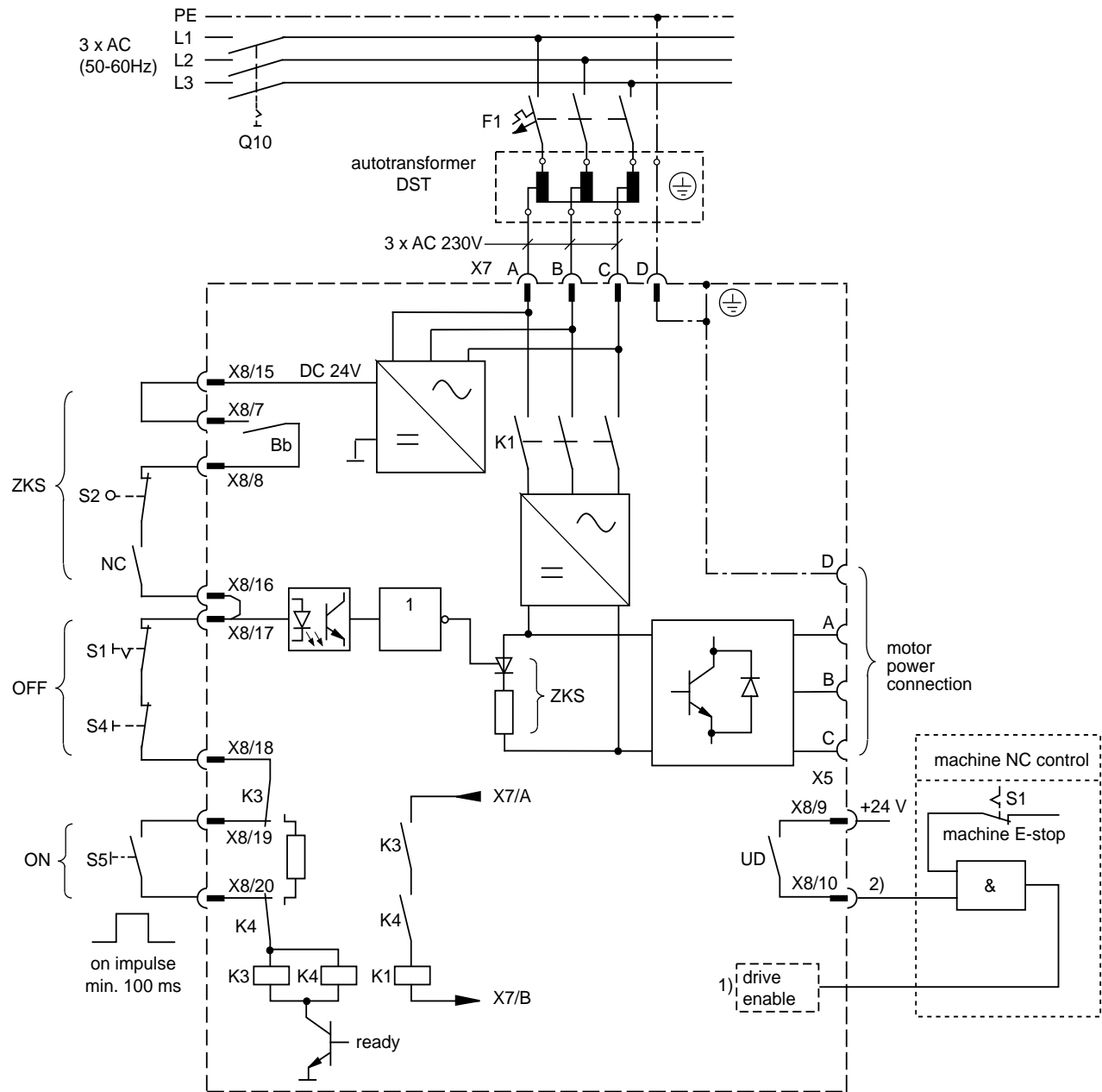


Fig. 3.13: Signal path diagram for switching on a DDC

# Control circuit of the DDC • with DC bus dynamic brake

- with E-stop, regulated braking by the drive electronics



- Bb = ready  
F1 = power supply fuse  
K1 = mains contactor in DDC  
K3 = auxiliary relay for switching K1  
K4 = auxiliary relay for switching K1  
NC = error message of the NC controls  
- open with faulty drive (servo error)  
- closed with E-stop  
Q10 = main switch

- S1 = E-stop  
S2 = end position of axis  
S4 = power off  
S5 = power on

- 1) Drive enable signal  
• drive enable input with analog interface  
• E-stop input with DLC

- 2) Only applies to DLC single-axis positioning modules

If the NC control unit of the machine switches the E-stop input of the DLC off when the UD contact is open, then the message "E-stop" is stored with each powering down. The NC control unit of the machine can, during the course of one program cycle and prior to starting the program, clear the message "E-stop" with a CLEAR signal. Under some circumstances, error diagnoses can be cancelled. It is not necessary to switch the E-stop input of the DLC off as part of a general powering down. As part of a general powering down, the NC controls of the machine can, for example, suppress the evaluation of the UD contact. The NC control of the machine cannot, however, start the program if the UD contact is closed.

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Fig. 3.14: Control circuit of the DDC mains contactor with dynamic brake

### 3.14. Control circuit of the DDC Mains Contactor Without Dynamic Braking

- Application**
- if an inductance motor is mounted to a DDC ( 2AD; 1MB; LAF; LAR )
  - if uncontrolled coasting cannot damage the installation.

**Features** The DC bus is not short-circuited. There can be no controlled braking of inductance drives if the DC bus is short-circuited.

The drives are braked by the drive electronics at maximum torque for an E-stop or a power disconnect.

**Operational principle** If the E-stop sequence is triggered, then K3 and K4 safely switch off mains contactor K1. The NC control unit of the machine simultaneously locks out the **drive enable** (RF input with analog interface, E-stop input of a DEA with a DLC single-axis positioning module). The command value of the drive is switched to zero. There is a controlled braking of the drive.



**The drives coast uncontrolled with a fault in the drive electronics. The short circuiting of the DC bus can only be dispensed with if a coasting of the drives cannot damage the facility. Motors with mechanical holding brakes can be used as an alternative.**

The signal sequence depicted in the diagram below is recommended.

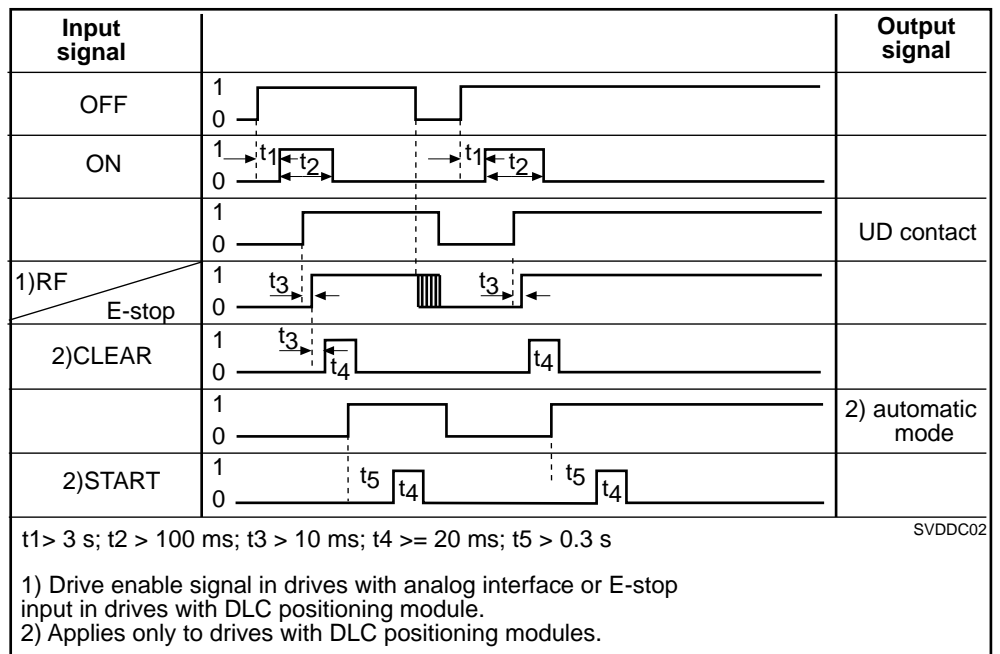
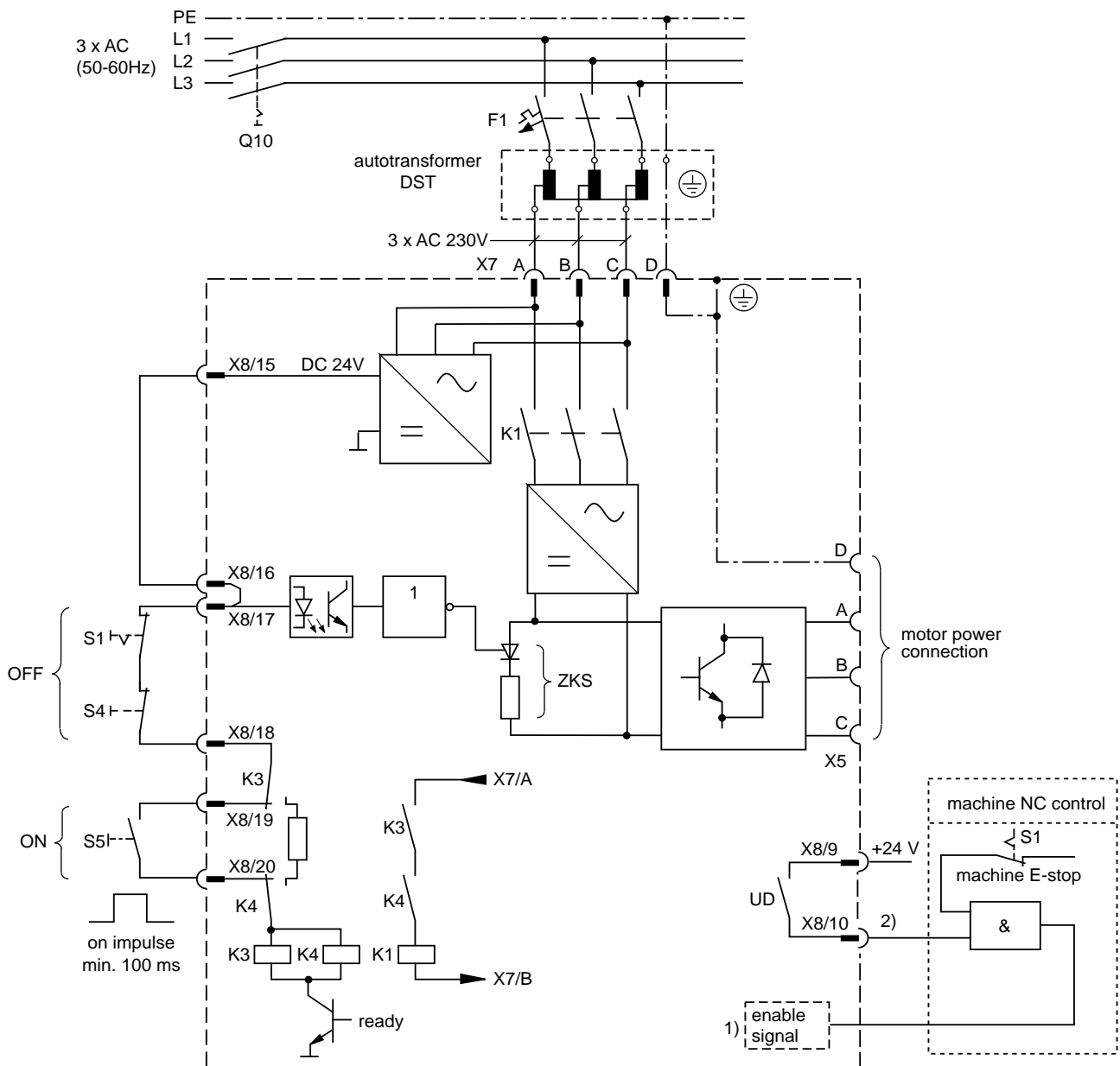


Fig. 3.15: Signal path diagram for switching on a DDC



# DDC control

- without DC bus dynamic brake
- regulated braking by the drive electronics with an E-stop



Bb = ready  
 F1 = power supply fuse  
 K1 = mains contactor in DDC  
 K3 = auxiliary relay for switching K1  
 K4 = auxiliary relay for switching K1  
 NC = error message of the NC controls  
     - open with faulty drive (servo error)  
     - closed with E-stop  
 Q10 = main switch

S1 = E-stop  
 S2 = end position of axis  
 S4 = power off  
 S5 = power on

- 1) Drive enable signal
- drive enable input with analog interface
  - E-stop input with DLC

2) Only applies to DLC single-axis positioning modules

If the NC control unit of the machine switches the E-stop input of the DLC off when the UD contact is open, then the message "E-stop" is stored with each powering down. The NC control unit of the machine can, during the course of one program cycle and prior to starting the program, clear the message "E-stop" with a CLEAR signal. Under some circumstances, error diagnoses can be cancelled. It is not necessary to switch the E-stop input of the DLC off as part of a general powering down. As part of a general powering down, the NC controls of the machine can, for example, suppress the evaluation of the UD contact. The NC control of the machine cannot, however, start the program if the UD contact is closed.

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Fig. 3.16: Control circuit of the mains contactor in a DDC without dynamic braking

### 3.15. Control Circuit of the DDC Mains Contactor with E-Stop Relays

- Application**
- if several E-stop switches are needed in larger installations or if, e.g., a safety door monitor is required or
  - if a synchronous motor (MDD) is connected to the DDC.

**Features** Dynamic braking always brakes synchronous motors to a standstill whether or not the drives electronics are operational. The DC bus is only **short-circuited if there is a drive fault**.

In the event of an emergency stop (E-stop) or a disconnect, the drives are **braked to a standstill at maximum torque by the drive electronics**.

**Operating Principle** If the ON button is pressed, then K3 and K4 safely switch on mains contactor K1. Should K3 or K4 fail, then power cannot be switched on.

If the E-stop button is pressed, then K3 and K4 safely switch off mains contactor K1. The NC control unit of the machine must simultaneously lockout the **drive enable** (RF input with analog interface, E-stop input of a DEA 3 with DLC single-axis positioning module). The command value of the drive is then switched to zero.

A drive error signal from the Bb contact of the DDC, an error signal from the controller (servo error), or an overtravelling of the limit switch disconnects the mains contactor and triggers dynamic braking.

The signal sequence as depicted in the diagram below is recommended for commissioning the DDC.

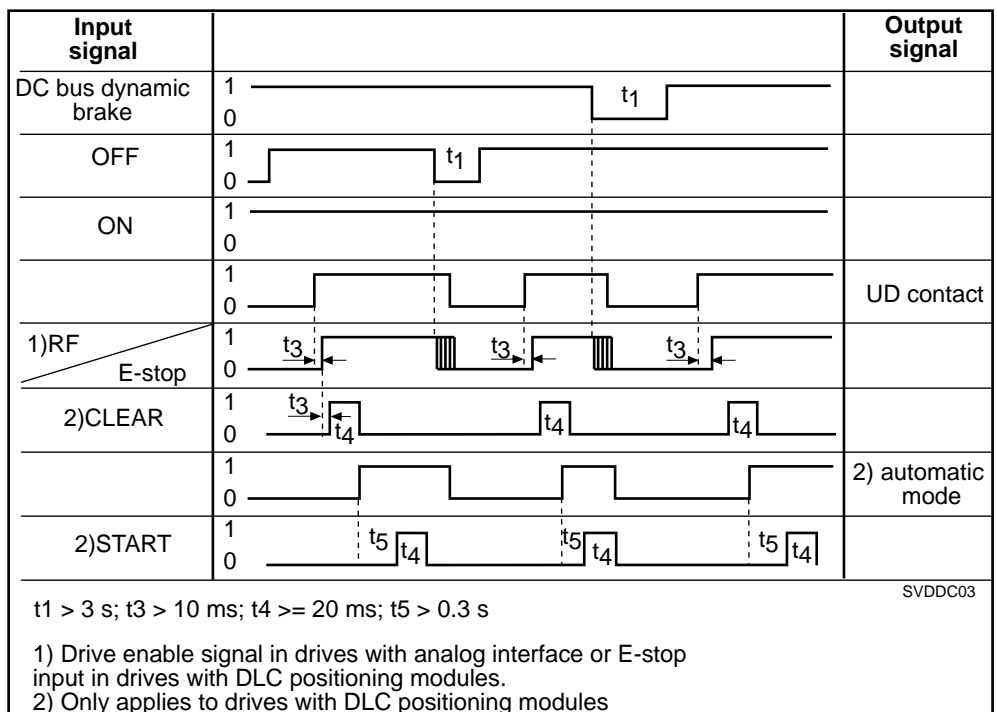
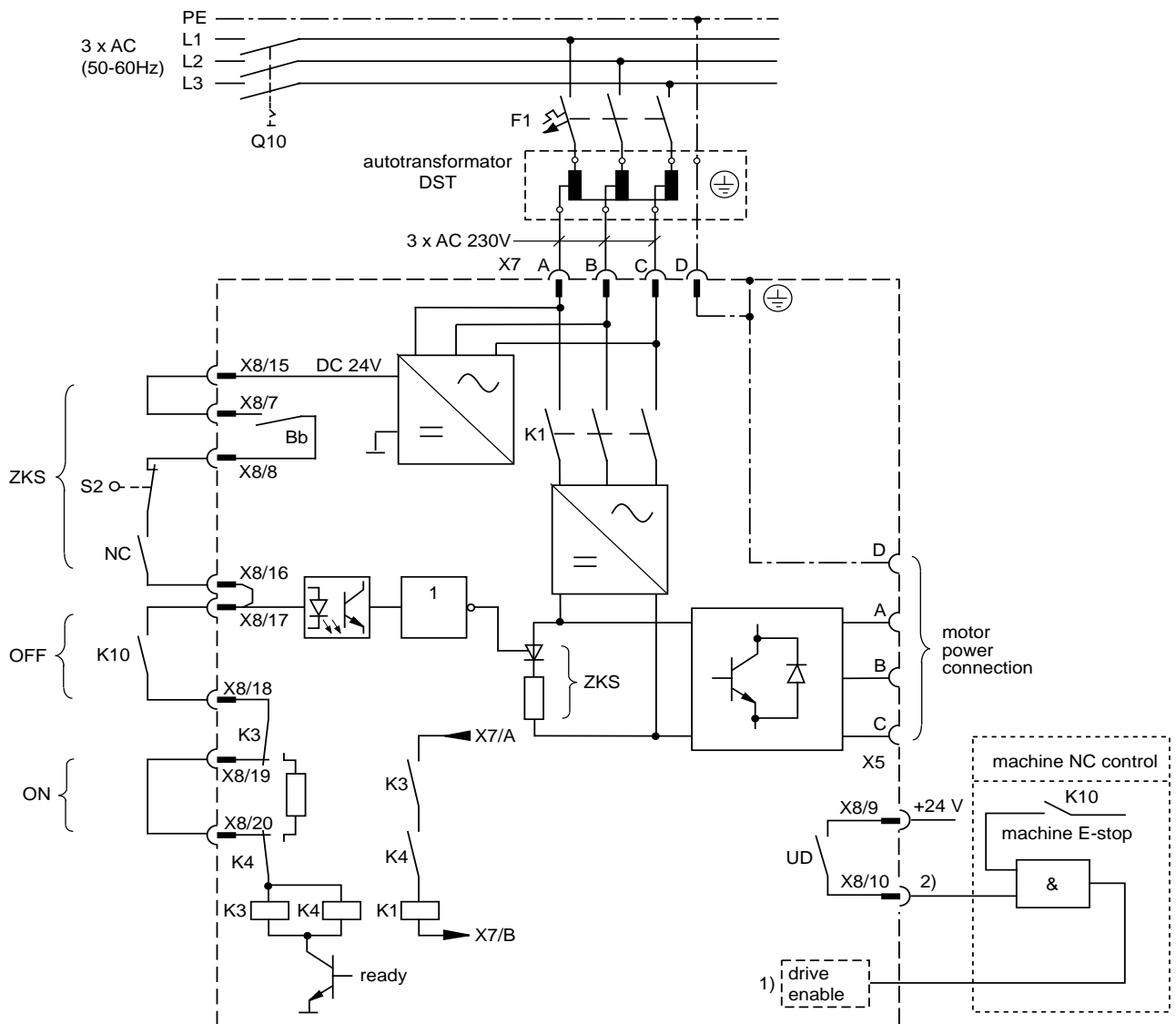


Fig. 3.17: Signal path diagram for switching on a DDC

NC control unit of DDC • with DC bus dynamic brake  
• if an E-stop relay is implemented

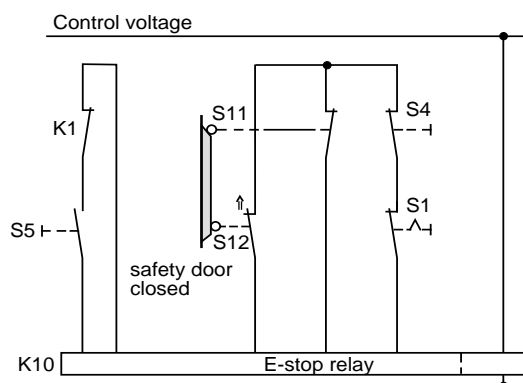


Bb = ready  
F1 = power supply fuse  
K1 = mains contactor in DDC  
K3 = auxiliary relay for switching K1  
K4 = auxiliary relay for switching K1  
K10 = E-stop relay  
NC = error message of the NC controls  
- open with faulty drive (servo error)  
- closed with E-stop  
Q10 = main switch  
S1 = E-stop  
S2 = end position of axis  
S4 = power off  
S5 = power on  
S11 = safety door monitoring  
S12 = safety door monitoring

1) Drive enable signal  
• drive enable input with analog interface  
• E-stop input with DLC

2) Only applies to DLC single-axis positioning modules

If the NC control unit of the machine switches the E-stop input of the DLC off when the UD contact is open, then the message "E-stop" is stored with each powering down. The NC control unit of the machine can, during the course of one program cycle and prior to starting the program, clear the message "E-stop" with a CLEAR signal. Under some circumstances, error diagnoses can be cancelled. It is not necessary to switch the E-stop input of the DLC off as part of a general powering down. As part of a general powering down, the NC controls of the machine can, for example, suppress the evaluation of the UD contact. The NC control of the machine cannot, however, start the program if the UD contact is closed.



Example: Depending on safety requirements at the machine, additional monitoring capabilities or locking devices may be necessary!

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Fig. 3.18: DDC mains contactor with dynamic brake and safety door monitor

### 3.16. Control Inputs

*DC bus dynamic brake* Connector: X8/15-X8/16  
Voltage: 24V DC  
Current consumption: 150 mA

| Input<br>ZKS    | open  | closed   |
|-----------------|---|--|
| Operating state | Power OFF<br>DC bus dynamic braking<br>active | Power ON<br>DC bus dynamic braking<br>not active |

The mains contactor on a DDC cannot be turned on unless ZKS input is closed. As an additional feature, when trouble occurs in the electronic system of the drive, the drive can be braked to a stop by opening the ZKS input. This causes the bus voltage to shorted internally in the DKC. The DC bus dynamic brake is an additional machine protection.

*Power OFF* Connector X8/17-X8/18  
Voltage: 24V DC  
Current consumption: 150 mA

| Input<br>OFF    | open      | closed   |
|-----------------|-----------|----------|
| Operating state | Power OFF | Power ON |

Only when the input is closed can the mains contactor be activated. If the Off input is opened, e.g., with an E-stop, then the mains contactor on the DDC is turned off immediately. However, the internal bus is not shorted.

*Power ON* Connector X8/19-X8/20  
Voltage: 24V DC  
Current consumption: 150 mA

| Input<br>ON     | open      | closed or open and<br>self-holding closed |
|-----------------|-----------|---|
| Operating state | Power OFF | Power ON                                  |

If the ZKS and the OFF inputs are closed and the device is ready, closing the ON input will perform a soft start for the power section in the DDC. The mains contactor then goes to a self-holding state. The activating pulse must be present for approximately 100 ms.

### 3.17. Signal and Diagnostics Outputs

*Ready state* Zero potential contact - Connector X8/7-X8/8  
Maximum load: DC 24V/1A (do not attach higher voltages!)

| Operating state  | Relay power off | Error | ready  |
|------------------|-----------------|-------|--------|
| <b>Output Bb</b> | open            | open  | closed |

The Bb contact signals that the drive is ready for powering up. Internal interlocking devices will not permit the mains contactor in the DDC to be turned on until it is closed. The mains contactor is deactivated and the Bb contact opened with an error. Once the Bb contact opens, there can be no controlled deceleration of the drives. It can, therefore, be used to trip the dynamic brake.

*DC bus voltage working* Zero potential contact - Connector X8/9-X8/10  
Maximum load: DC 24V/1A  
AC 250V/1A

| Operating state  | Relay power off | Error | Power working |
|------------------|-----------------|-------|---------------|
| <b>Output UD</b> | open            | open  | closed        |

The UD contact is closed if the DC bus voltage is greater than 200 V and the mains contactor is turned on.

The UD contact can be used as a prerequisite for releasing the feed function.

*Bleeder Prewarning* Zero potential contact - Connector X8/11-X8/12  
Maximum load: DC 24V/1A  
AC 250V/1A

| Operating state   | Relay power off | Bleeder load too high | Bleeder load within permissible limits |
|-------------------|-----------------|-----------------------|--|
| <b>Output BVW</b> | open            | open                  | closed                                 |

The bleeder warning contact opens, if continuous regenerated power is greater than 75% of continuous bleeder power. Should the bleeder load continue to climb to thermal overload, then the power supply to the DDC is discontinued.

*Mains contactor picked up* Zero potential contact - Connector X8/3-X8/4  
 Maximum load: DC 24V/10A  
 AC 230V/6A

| Operating state | contactor dropped | contactor picked up |
|-----------------|-------------------|---------------------|
| Output Power ON | open              | closed              |

It can be queried at output power ON whether the mains contactor has been switched on. The closed contact can be used as a condition for the drive enable signal.

*Mains contactor dropped out* Zero potential contact - Connector X8/1-X8/2  
 Maximum load: DC 24V/10A  
 AC 230V/6A

| Operating state  | contactor dropped | contactor picked up |
|------------------|-------------------|---------------------|
| Output Power OFF | closed            | open                |

It can be queried at output OFF whether the mains contactor has dropped out. This information can, for example, be used as a condition to release the door locking device.

*Analog diagnoses outputs AK1 and AK2* For diagnostics purposes, drive data can be output at analog outputs AK1 and AK2. Which drive quantities are output is determined at commissioning.

Output voltage:  $\pm 10$  V  
 Load capacity: 4 mA

### 3.18. Signal Voltages

It is possible to tap off  $\pm 15$ V and +24V at connector X8. These connections are specifically used for measuring and test purposes. Should these voltages be applied outside of the DDC, then no interference voltages may be coupled in (short and shielded supply lines).



**The signal voltage outputs are short-circuit proof. Maximum load should not be exceeded, otherwise the drive could be damaged.**

|       |        |                     |           |
|-------|--------|---------------------|-----------|
| X8/21 | +15VM  | measuring voltage   | max.100mA |
| X8/22 | 0VM    | reference potential |           |
|       |        | measuring voltage   |           |
| X8/23 | -15VM  | measuring voltage   | max.100mA |
| X8/24 | +24VL  | load voltage        | max.100mA |
| X8/25 | 0VL    | reference potential |           |
|       |        | +24VL               |           |
| X8/26 | ground | shield              |           |

### 3.19. Reading Drive Parameters

**RS 232 Interface** A VT 100 terminal or a PC with a VT 100 emulation program can be connected at connector X2 via an RS 232 interface to a DDC drive with analog command value input or with a single-axis positioning module.

Drive parameters, such as amplification of velocity loops, can be output and optimized, if necessary, via these interfaces at the time of commissioning.

Fault diagnostics are displayed in plain text in the event that service is needed.

Ready-made service cable INK 391 is available for connecting the DDC to a PC (available lengths: 2, 5, 10 and 15 meters).

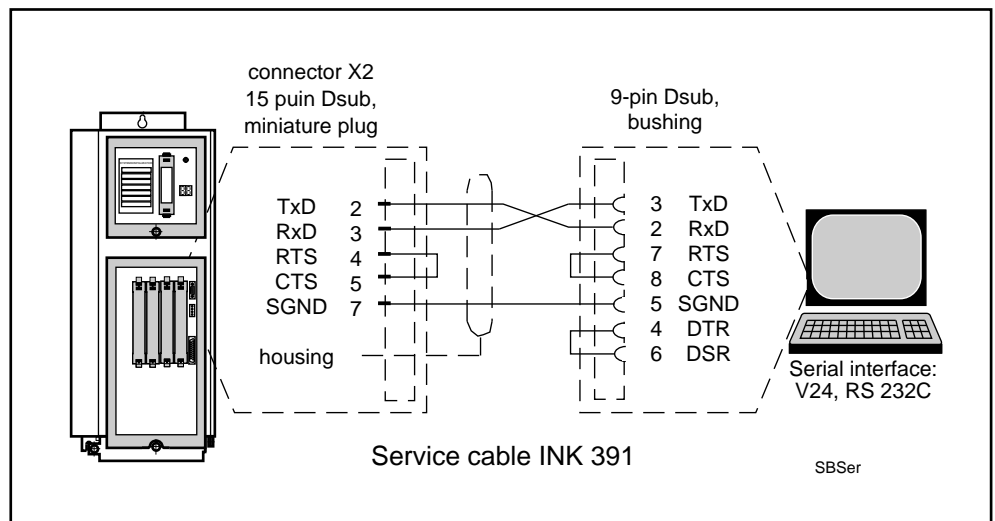


Fig. 3.19: RS 232 interface

### 3.20. Regenerated Power

During braking, the energy stored in the drive is absorbed by the bleeder in the DDC. Do not exceed continuous bleeder power. See data sheets for precise data.

*Continuous bleeder power*

Continuous bleeder power is dependent upon rotary drive energy, potential energy of unbalanced mass and the number of machine cycles completed.

$$P_{RD} = \frac{W_{rotg} + W_{potg}}{t_z}$$

|            |   |   |
|------------|---|---|
| PRD        | = | continuous regenerated power or cont. bleeder power in kW |
| $t_z$      | = | cycle time in s   |
| $W_{potg}$ | = | sum of potential energy in kW                             |
| $W_{rotg}$ | = | sum of rotary energy in kW                                |



**When operating main drives in particular (2AD and 1MB), check whether continuous bleeder power and maximum regenerated energy during braking are not exceeded -- as per the data sheets.**

### 3.21. Fault Current Protective Device

Capacitive discharge currents always flow to earth in switch-mode drives.

The extent of the discharge current is dependent upon:

- the number of drives used,
- the length of the motor power cable,
- the motor type and
- the ground conditions at the installation site.

The discharge current is unavoidably increased, if measures are taken to improve the electromagnetic compatibility (EMC) of the machine (mains filters or shielded cables).

FI current limiting circuit breakers with a nominal fault current smaller than 0.3 A should **not** be used!

Switching inductors on, e.g., transformers, contactors or electromagnetic valves, can cause false tripping.



**The safety of electronic equipment with three-phase bridge connections, B6 switches, cannot be guaranteed if commercial, pulse-current sensitive FI protective circuit breakers are used. For this reason, FI circuit breakers should not represent the only safety measures taken.**

### 3.22. High-Voltage Testing

**Connect only those voltages outlined in the data sheets or in the interface descriptions.  
Remove all connections to the DDC 1 before performing any high voltage checks.**



## 4. Mounting the DDC 1.2

The protection category of the DDC 1.2 is IP 65. It can be directly mounted to the feeding device. Long cable connections susceptible to interference are thus avoided.

### 4.1. DDC 1.2-N - dimensional data

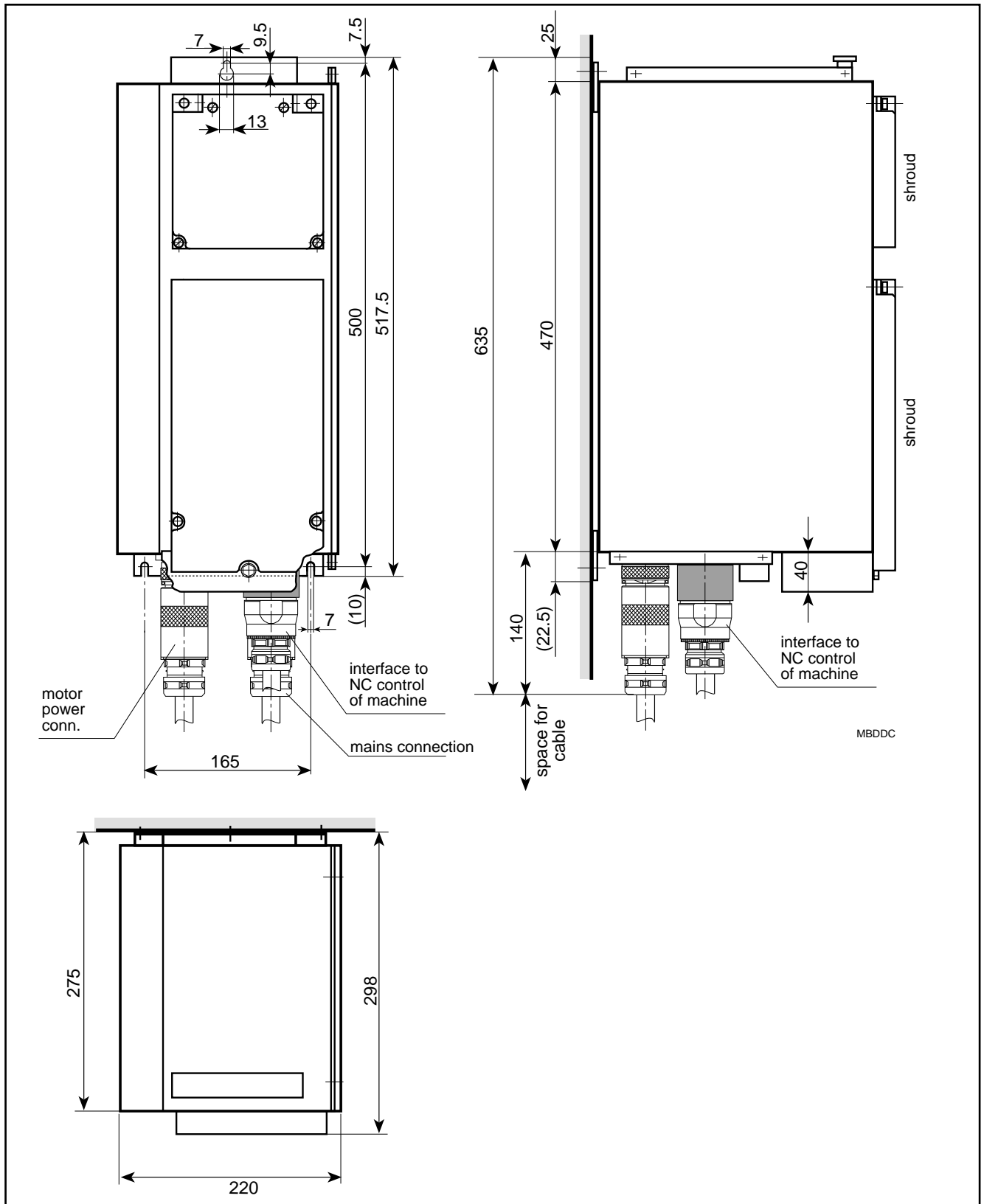


Fig. 4.1: DDC 1.2 - dimensional data

## 4.2. Front View of DDC 1.2-N

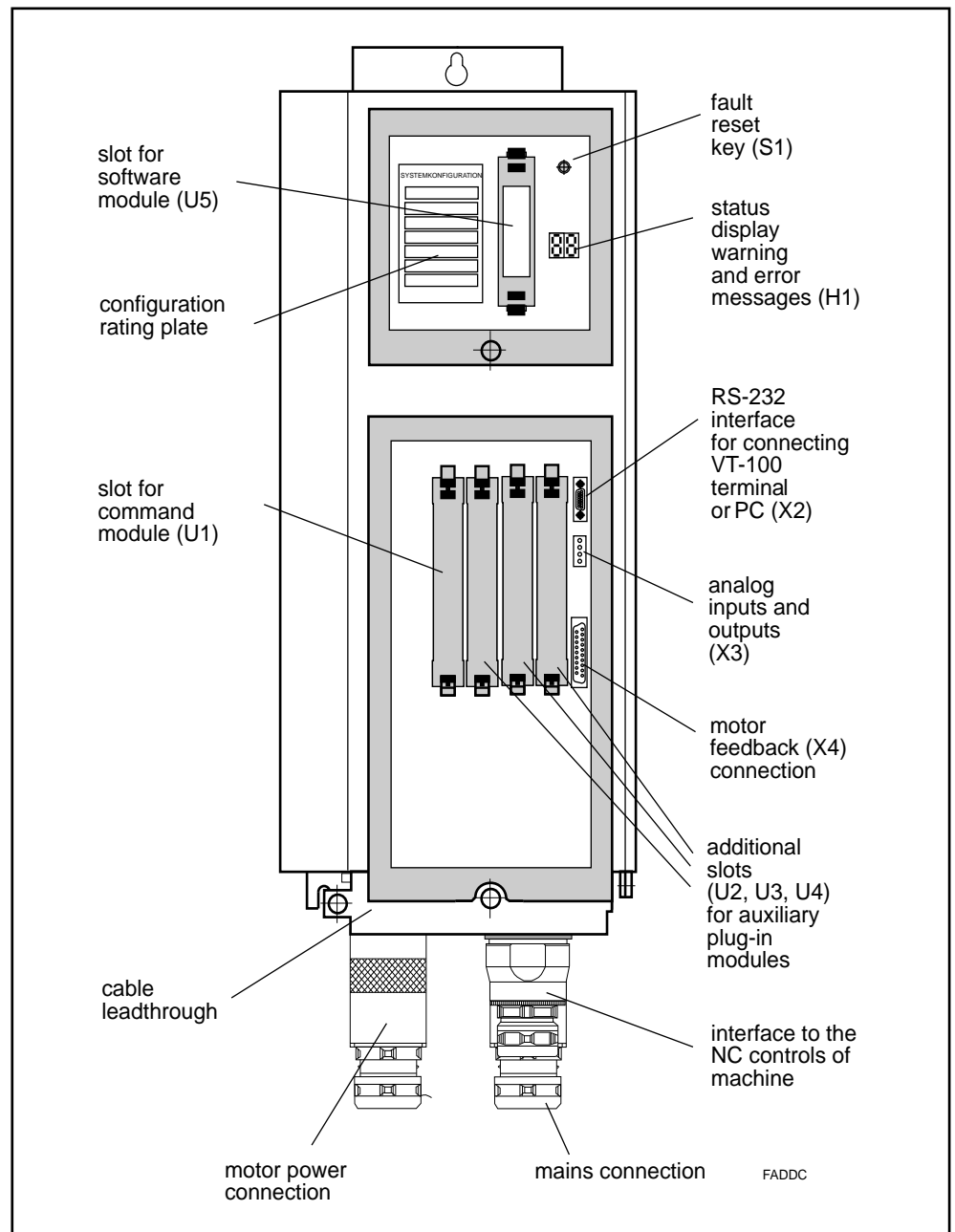


Fig. 4.2: Front view of DDC 1.2-N

### 4.3. Power Connections

The protection category of the power terminal connectors (X7) of the DDC, the motor power terminal (X5), and the NC control unit interface (X8) is IP 65.

The motor feedback cable and the connections for the optional plug-in cards are inserted in the DDC. These connections run through the cable leadthrough along the underside of the DDC. These must be carefully installed to maintain the IP 65 protection category.

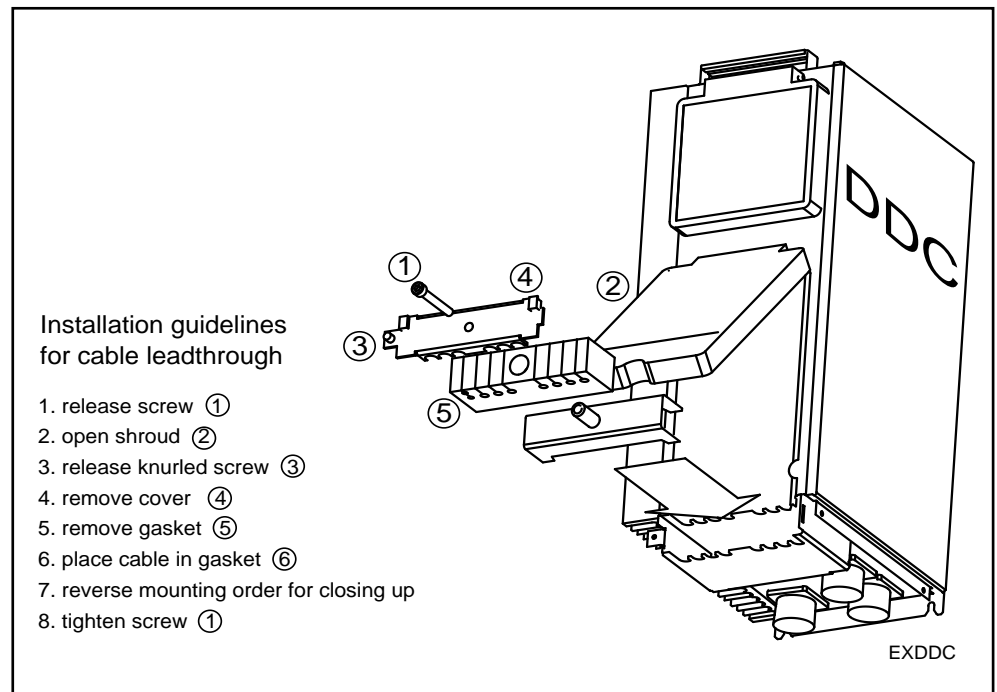


Fig. 4.3: Installing the cable leadthrough

#### 4.4. Minimum Clearances

During installation, make sure that the air outlet is not obstructed and the bend radii of the cables are maintained.

Minimum clearance equals allowance for power connectors plus bend radius, but not smaller than 300 mm.

*Bend radii of  
INDRAMAT cables*

| Type    | Power<br>core<br>diameter<br>(mm <sup>2</sup> ) | Power<br>cable<br>diameter<br>(mm) | Minimum Bend Radius   |  |
|---------|---|------------------------------------|-----------------------|--|
|         |   |                                    | fixed routing<br>(mm) | flexible routing <sup>1)</sup><br>(mm) |
| INK 250 | 1.5   | 11.4 ± 0.4                         | 70                    | 110                                    |
| INK 202 | 2.5   | 17.6 +0.3/-0.5                     | 120                   | 200                                    |
| INK 203 | 4.0   | 18.6 ± 0.5                         | 120                   | 270                                    |
| INK 204 | 6.0   | 20 ± 0.5                           | 120                   | 300                                    |
| INK 205 | 10.0  | 25.4 ± 0.5                         | 200                   | 380                                    |
| INK 206 | 16.0  | 26.6 ± 0.5                         | 220                   | 390                                    |
| INK 207 | 25.0  | 30.6 ± 0.7                         | 240                   | 430                                    |
| INK 650 | 1.5   | 12.2 ± 0.4                         | 80                    | 120                                    |
| INK 602 | 2.5   | 14.8 ± 0.5                         | 85                    | 140                                    |
| INK 603 | 4.0   | 16.9 ± 0.5                         | 110                   | 180                                    |
| INK 604 | 6.0   | 18.8 ± 0.6                         | 120                   | 195                                    |
| INK 605 | 10.0  | 23.8 ± 0.5                         | 150                   | 240                                    |
| INK 606 | 16.0  | 28.2 ± 0.6                         | 160                   | 280                                    |
| INK 607 | 25.0  | 29.5 ± 0.6                         | 190                   | 290                                    |

<sup>1)</sup> Service life greater than 500 000 bend loads.

Fig. 4.4: Bend radii of INDRAMAT cables

**Safety Clearances** The bleeder resistor in the DDC heats up during operation. Flammable materials or parts which could deform in the hot air stream, e.g., polyvinylchloride cable conduits, must maintain a minimum clearance of 300 mm to the air outlet.

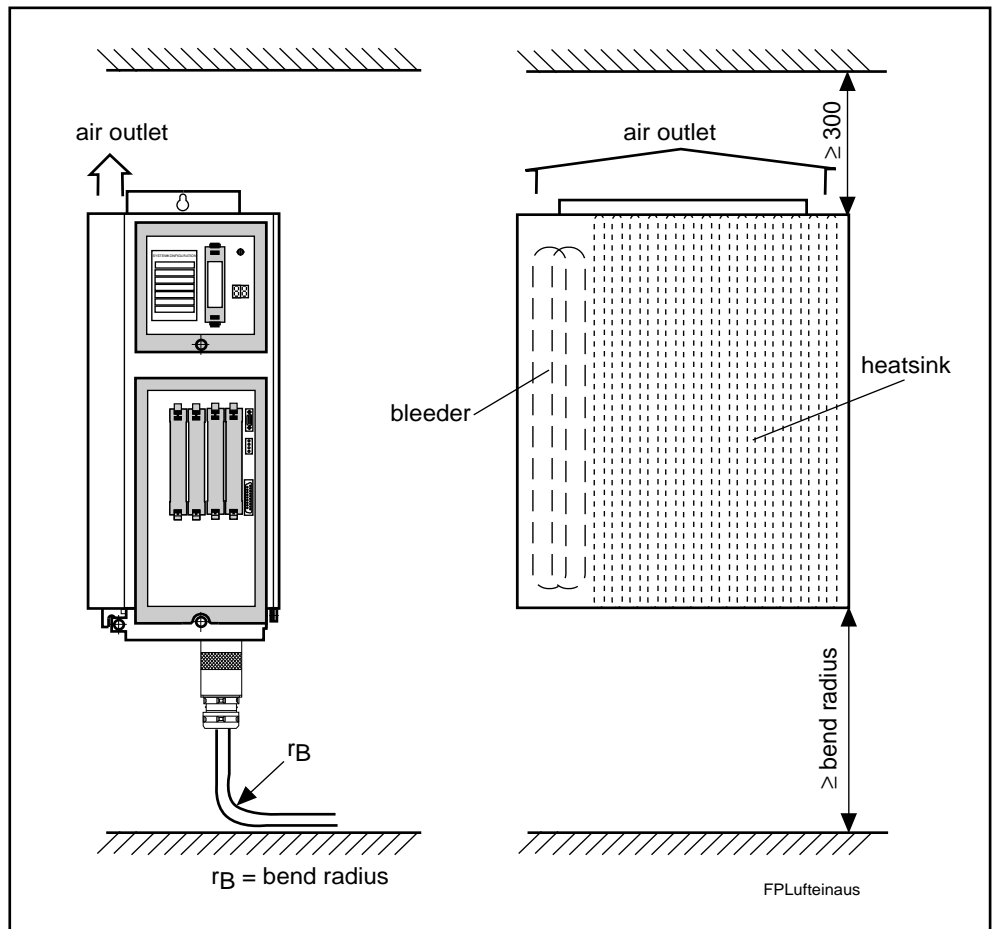
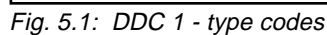


Fig. 4.5: DDC - air inlet and outlet and position of bleeder resistor



The DDC 1.2 generally needs no maintenance. If it is operated in a very dirty environment, and if heatsink could become clogged, e.g., by foundry dust, then these should be regularly checked. If the device function is inhibited by dirt, then both the blower and the heatsink should be cleaned.

### 5.1. Type Codes for the DDC 1.2



## 5.2. Accessories for Connections

The following connectors and connector sets are available where ready-made cables are not used.

### *Individual IP 65 connectors*

IP 65 connectors are used for the power connections of the DDC, motor power cable connections and the NC control unit connections.

| Name                                  |                 | Connector type           |
|---------------------------------------|-----------------|--------------------------|
| Power connection                      | DDC 1.2-N050C   | INS 108/.. <sup>1)</sup> |
|                                       | DDC 1.2-N ... A | INS 172/..               |
| Motor power cable                     | DDC 1.2-N050C   | INS 110/.. <sup>2)</sup> |
|                                       | DDC 1.2-N ... A | INS 217/..               |
| Connection to machine NC control unit |                 | INS 478                  |

1) For complete types see 3.4

2) For complete types see 3.10

The plug-in module connections are inserted in the DDC 1. Select the relevant connector set (S..-DDS 2) after discussing your requirements with your INDRAMAT Sales Office.

*Individual connector sets* If ready-made cable sets are only partially used, then the still required connectors for the plug-in modules can be ordered separately.

| Components   | Conn. strip | Name of plug-in connector                                    | Part number        | Text                              | Comment  |
|--|-------------|--|--------------------|-----------------------------------|--|
| DDS 2, DDS 3 drive controller                              | X4          | plug-in connector for feedback conn., 15 pin Dsub, male      | 231 715            | CONN. INS290                      | plug-in connector not needed with ready-made feedback cable  |
| DKS 1 drive controller                                     | X4          | plug-in connector for feedback connection, 15 pin Dsub, male | 231 715            | CONN. INS290                      | plug-in connector not needed with ready-made feedback cable  |
| DSS 1.1, DSS 1.3, DSS 2.1 SERCOS Interface                 | X10         | plug-in connector for LWL cable (fiber optic cable)          | 244 069 or 244 062 | CONN. INS420 or CONN. INS425      | INS420 for LWL cable INK414 with 2,2mm Ø for control encl. internal connections  |
|  | X11         | plug-in connector for LWL cable                              | 244 069 or 244 062 | CONN. INS420 or CONN. INS425      | INS425 for LWL cable INK416 with 6.0mm Ø or for connections internal to control enclosure (plug-in connector with use of ready-made LWL cable IKO... not needed) |
|  | X12         | 9 pin plug-in terminal                                       | 241 591            | CONN.-KL3,81 F MC 1,5/ 9ST B 1-9  |  |
| DAE 1.1 ANALOG Interface with incremental encoder emulator | X13         | 10 pin plug-in terminal                                      | 241 647            | CONN.-KL3,81 F MC 1,5/10ST B 1-10 |  |
|  | X14         | 15 pin Dsub, female  | 231 714            | CONN. INS289                      |  |
| DAA 1.1 ANALOG Interface with absolute encoder emulator    | X15         | 10 pin plug-in terminal                                      | 241 647            | CONN.-KL3,81 F MC 1,5/10ST B 1-10 |  |
|  | X16         | 15 pin Dsub, female  | 231 714            | CONN. INS289                      |  |
| DZF 1.1 gear toothed interface                             | X20         | 15 pin Dsub, male  | 231 715            | CONN. INS290                      |  |
| DLF 1.1 high-resolution position interface (Sine signal)   | X23         | 15 pin Dsub, male  | 231 715            | CONN. INS290                      |  |
| DEF 1.1 incremental position interface (squarewave signal) | X22         | 15 pin Dsub, male  | 231 715            | CONN. INS290                      |  |
| DEF 2.1 incremental position interface (squarewave signal) | X24         | 15 pin Dsub, male  | 231 715            | CONN. INS290                      |  |
| DEA 4.1 Inputs/outputs (I/O) module                        | X17         | 37 pin Dsub, female  | 231 718            | CONN. INS293                      |  |
| DEA 5.1 Inputs and outputs (I/O) module                    | X32         | 37 pin Dsub, female  | 231 718            | CONN. INS293                      |  |
| DEA 6.1 Inputs/outputs (I/O) module                        | X33         | 37 pin Dsub, female  | 231 718            | CONN. INS293                      |  |
| DLC 1.1 Positioning module                                 | X30         | ready-made cable   |                    |                                   | ready-made cable IKS 745/... for programing and display unit (max. length 30m)   |
|  | X31         | 9 pin Dsub, male   | 231713             | CONN. INS288                      |  |



| Components                                  | Conn. strip | Name of plug-in connector   | Part number              | Text                                | Comment  |
|---|-------------|-----------------------------|--------------------------|-------------------------------------|--|
| DRF 1.1<br>analog signal interface          | X36         | 15 pin Dsub,<br>male        | 231 715                  | CONN. INS290                        |  |
| DBS 1.1<br>Interbus S Interface             | X37         | 9 pin Dsub,<br>female       | 259 762                  | CONN. INS526                        |  |
|   | X38         | 9 pin Dsub,<br>male         | 259 759                  | CONN. INS525                        |  |
| CLC-D 1.1<br>cont. card                     | X25         | plug-in conn. for LWL cable | 244 069<br>or<br>244 062 | CONN. INS420<br>or<br>CONN. INS425  | INS420 for LWL cable INK414<br>with 2.2mm Ø for control encl.<br>connections internal<br><br>INS425 for LWL cable INK416<br>with 6.0mm Ø or for control encl.<br>connections internal<br>(plug-in conn. if ready-made<br>LWL cable is used<br>IKO... not needed) |
|   | X26         | plug-in conn. for LWL cable | 244 069<br><br>244 062   | CONN. INS420<br>or<br>CONN. INS425  |  |
|   | X27         | 9 pin Dsub,<br>male         | 257 044                  | CONN. INS454                        |  |
|   | X28         | 9 pin Dsub,<br>male         | 257 044                  | CONN. INS454                        |  |
|   | X29         | 2 pin plug-in terminal      | 253 897                  | STECK-KL3,81 F<br>MC 1,5/ 2ST B 1-2 |  |
|   |             |                             |                          |                                     |  |
| DFF 1.1<br>Single-turn encoder<br>Interface | X18         | 15 pin Dsub,<br>male        | 231 715                  | CONN. INS290                        |  |
|   | X19         | 15 pin Dsub,<br>female      | 231 714                  | CONN. INS289                        |  |

### 5.3. Item List

| Pos. | Article  | Selection                                      |
|------|--|--|
| 1.   | <b>Drive controller</b><br>DDC 1.2-.....-.....-  | Selection data                                 |
| 1.1  | <b>Firmware FW . . .</b>   | Ask your<br>local<br>INDRAMAT-<br>Sales Rep.   |
| 1.2  | <b>Power connection</b><br>Ready-made cable IK. .../..<br>or<br>Connector INS ... and cable INK ... /..  | 3.4  |
| 1.3  | <b>Motor power cable</b><br>ready-made cable IK. .../..<br>or<br>cable INK ... /.. ; motor side<br>Connector INS ... and machine side<br>Connector INS ...   | 3.9  |
| 1.4  | <b>Connection to NC control</b><br>ready-made cable IKS 083/..<br>or connector INS 478 and cable INK 271   |  |
| 1.5  | <b>Motor feedback cable</b><br>ready-made cable IKS 374/..<br>or<br>cable INK 209/.. ; motor side<br>Connector INS 513 and machine side<br>Connector INS 290 ( Note: the connector<br>INS 290 is part of connector kit S.- DDS 2 ) |  |
| 2.0  | <b>Conneting accessories for<br/>machine configuration</b><br>Ready-made cable<br>or<br>connector kit S.-DDS 2   | Documentation for the<br>plug-in module<br>5.2 |
| 3.0  | <b>Transformer</b>   | 3.2, 3.5, ..., 3.8                             |

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